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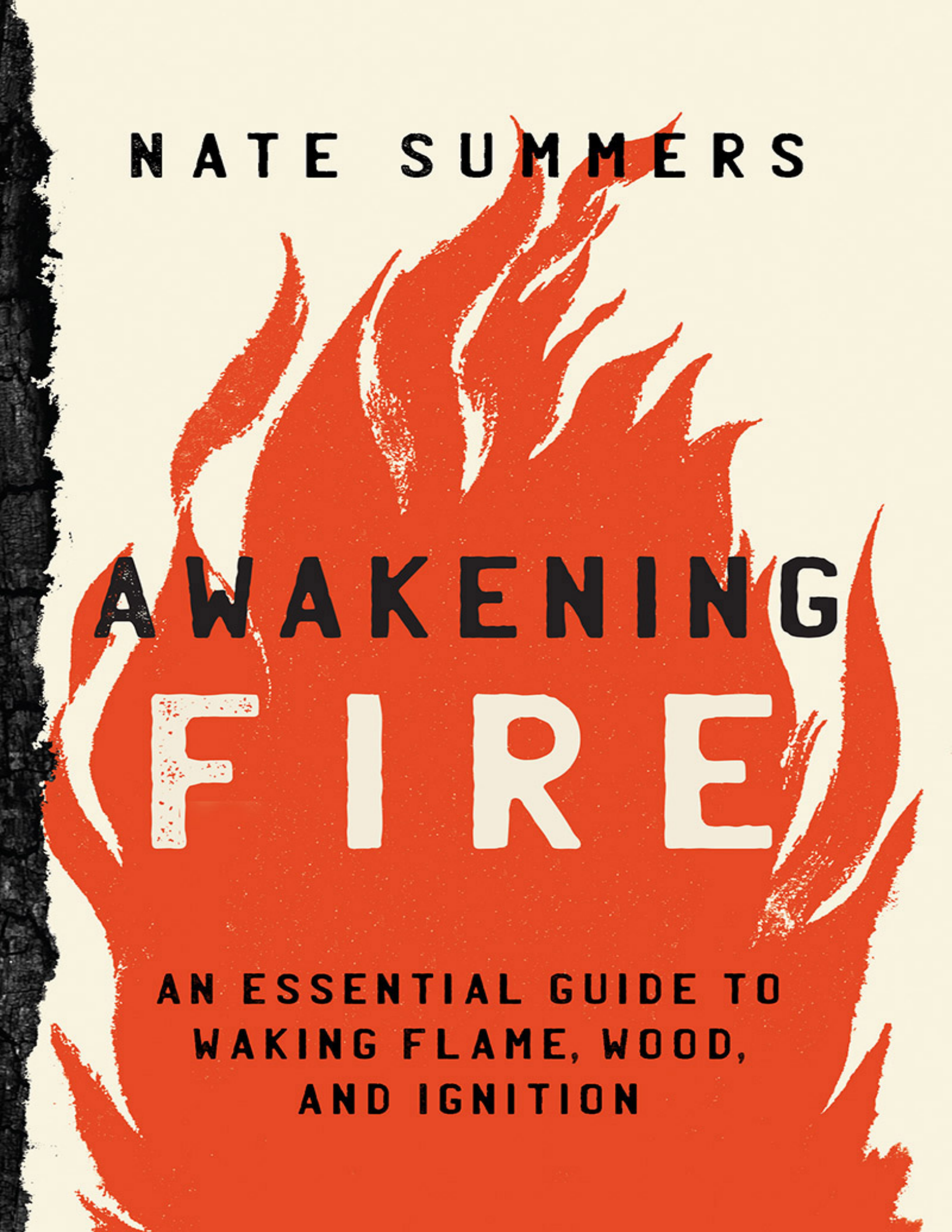
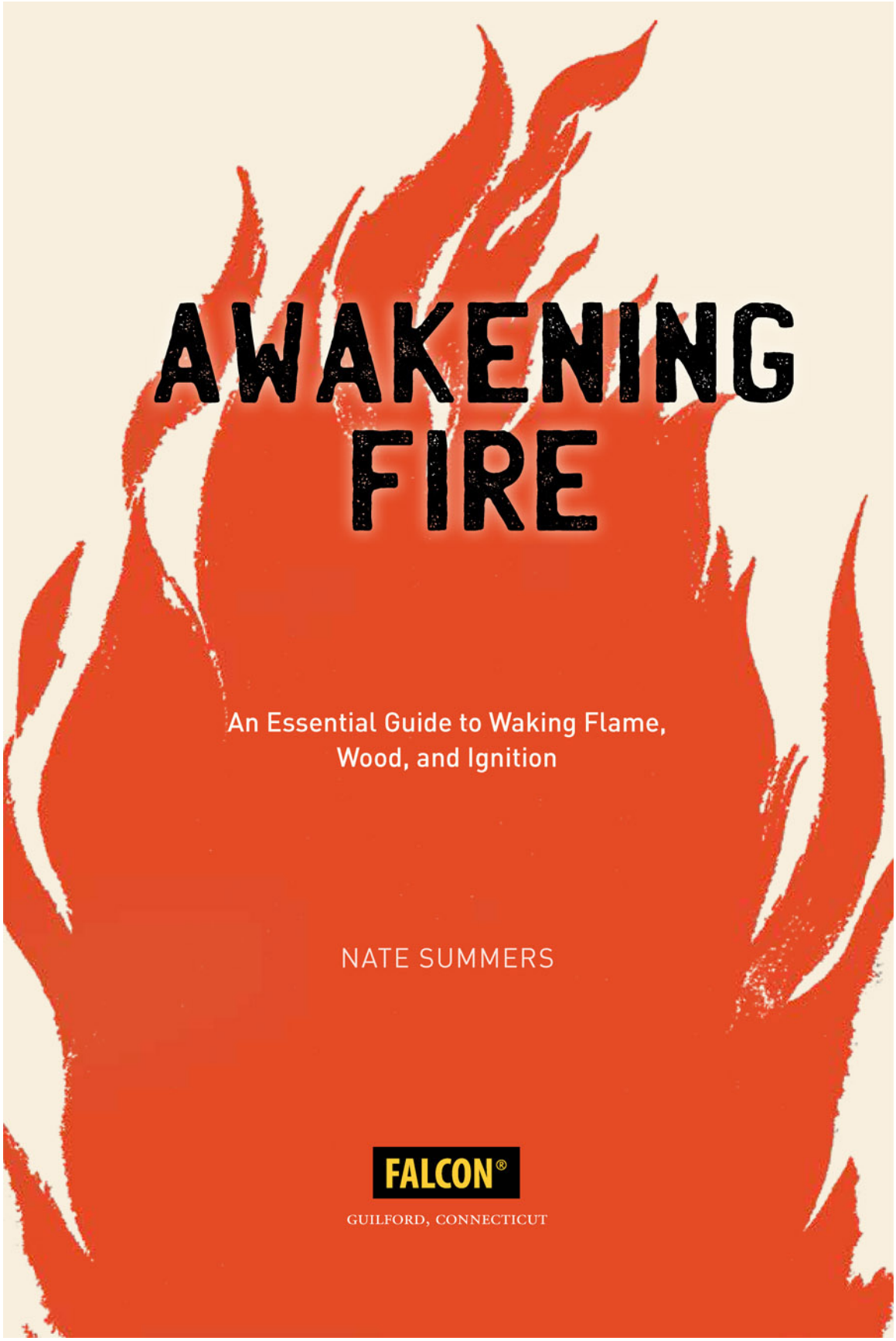


AWAKENING FIRE

AN ESSENTIAL GUIDE TO WAKING FLAME, WOOD, AND IGNITION


AWAKENING
FIRE
An Essential Guide to Waking Flame,
Wood, and Ignition
NATE SUMMERS
FALCON®
GUILFORD, CONNECTICUT

Dedicated to the fire-makers, fire-tenders, and coal-carriers who've kept these arts alive . . .

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4501 Forbes Blvd., Ste. 200
Lanham, MD 20706
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British Library Cataloguing in Publication Information available

Library of Congress Cataloging-in-Publication Data

Names: Summers, Nate, author. | Taylor, Mink, illustrator.
Title: Awakening fire : an essential guide to waking flame, wood, and ignition / Nate Summers.
Description: Guilford, Connecticut : Falcon, [2021] | Includes bibliographical references. | Summary: “Discusses the basic principles of fire-making, different fire-starting methods and structures for almost any conditions, and fire safety information. Includes a section devoted to the most useful species for each bioregion in North America”—Provided by publisher.

Identifiers: LCCN 2020040136 (print) | LCCN 2020040137 (ebook) | ISBN 9781493052868 (paperback) | ISBN 9781493052875 (epub)
Subjects: LCSH: Firemaking—North America. | Fire prevention—North America. | Survival—North America.
Classification: LCC GN417 .S86 2021 (print) | LCC GN417 (ebook) | DDC 796.54/5—dc23
LC record available at https://lccn.loc.gov/2020040136
LC ebook record available at https://lccn.loc.gov/2020040137

The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI/NISO Z39.48-1992.

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CARRYING COALS

I think often of the before times
When we roamed in
Small bands and fire
Was our constant companion.

Of those diligent keepers
Who, though the wind and rain
Was indifferent
And the prowling uncertainties
Lurked always in the darkness

And at times even
The dream of warmth
Seemed forbidden,

Carried with them
That little glow,
Tenderly wrapped in a nest
Of barks and mosses,

Just waiting for
That steady hand,
That patient breath,
To bring us back to life.

—Quinn Bailey

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INTRODUCTION

AN ANCIENT SKILL AND ART

I’ve got an embarrassing confession to share: I used to think that everybody just knew how to make fire.

I’d spent more than two decades teaching survival skills to people of all ages and walks of life, and I thought I’d seen it all. But then two men who’d hired me to teach a custom survival-skills class surprised me. In an attempt to start a fire, they sat holding a lighter to a single, full-sized log.

I didn’t quite know what to do or say. I had seen this kind of behavior with kids before, but never with adults. I didn’t want to embarrass these guys, but I was flabbergasted that these two gentlemen had no idea that you couldn’t start a fire simply by lighting a large chunk of wood on fire with a lighter or matches.

After an awkward pause, I gently showed these two guys how to gather soft, light, dry, fuzzy material for tinder and add in small, lightweight twigs for mini kindling. We started a small fire with those materials, and after billeting some bigger wood with our knives, we soon had quite the blaze going. Eventually we did add some larger chunks of wood to keep the lit fire roaring. We enjoyed the warmth radiating from the fire, listening quietly to the crackle of the flame and feeling its protection against the cold dampness sinking in from the rain nearby. Eventually we cooked some apples, bananas, and sausages on the coals from the wood after the flame

had died down. What had started as an awkward moment turned into a real opportunity for learning. The book you are reading may have been born on that day.

Later, after working with more adults from the general population, I realized that what happened that day with those two men is actually fairly common. In fact, a lot of people (potentially a vast majority) now grow up unaware of basic outdoor living skills. And I'm not talking about sophisticated survival skills, such as how to get a fire going under hard conditions without a source of ignition brought with you, or how to build a snow shelter in a blizzard. I'm talking about how to build a simple fire without dowsing it with a gallon of gasoline, or how to operate a woodstove, or how to use a fireplace without filling the house with smoke.

It became apparent to me: In this modern life, we have lost touch with the ancient art of making fire.

Fire kept our ancestors alive. It was part of what made them human. Fire helped them cook food; it kept them warm during the winter; it may have helped them survive when they were lost or separated from their village; and it helped them make many of the other tools and technologies they needed to live and thrive. If it weren't for fire, neither you nor I would be here. We wouldn't be human beings without the influence of fire as one of our earliest and most powerful technologies (as recounted in myths around the world).

The book you are reading attempts to rectify our loss of connection.

This lost connection with fire is a relatively new development in human history. As recently as just a few generations ago, most people knew how to make fire. Fire was still needed to heat houses with woodburning stoves and fireplaces. Fire was used for cooking, camping, and hunting. But the influx of modern technology throughout the developed world eroded our connection, and as new technologies, like auto-programmed heating systems and gas-burning stoves with turn-of-the-button ignition, entered our homes, the essential skill of learning to create fire took a backseat.

What happens when we lose this connection? What are we missing out on when we no longer have the opportunity to gather around a rich, warm, deep blaze? What happens to our minds, emotions, and psyche when the glow and warmth of fire is replaced by the blue-white glow of a screen? There's an opportunity for us all here—an opportunity to reestablish or save our relationship with this most basic element. And who knows what might

happen? Perhaps reigniting this ancient skill and element might stoke the inner fire within each of us. By gathering wood, lighting a fire, cooking food over it with friends and family, we might find something that is lacking in our modern world—connection, remembrance, and a feeling of being truly human.

This book is designed to be a useful and easy guide to help you rediscover and reinvigorate the art of making fire. Helpful for hikers, campers, families, and outdoor enthusiast alike, it is also full of useful information in the unlikely event of a survival emergency. Since fire is more important than simply supplying warmth and cooking food, I've broken down this book into parts for a deeper dive. We will start by looking at the culture and history of fire—discovering the role it has played and why it is essential to us as human beings. The following chapters will break down the core components of making a fire. We will go deeply into the how-to of fire—learning different ways of making fire, how to make fire under a variety of conditions, and how to make fire a part of your life for fun, recreation, heating, and survival. All the key components and techniques of making fire will be shared along with easy ways to make them happen in your life. Finally, we will go on a journey across the bioregions of the United States. Specific plant species for each region that are useful and helpful for making fire will be presented. Essentially, you will be prepared to make fire almost anywhere in the country. Finally, we will wrap up with information on how to practice, integrate, and hopefully master the skills and art of making fire that will lead you into a lifelong journey and relationship with a master teacher: fire itself.

My hope is that this book serves both as an inspiration and a guide, and even becomes like an old friend for you on this journey. I am certainly thankful for my own teachers, mentors, and guides who awakened my own relationship with fire. May this book awaken your own fire, both inner and outer.

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HUMANS AND FIRE

Prometheus stole it from Zeus as a favor to humankind. Coyote snuck up a mountain and dodged two giant, hairy monsters to steal a bit and bring it down. Rainbow Crow flew all the way to the sun and burned away its beautiful rainbow plumage to bring some back. Maui, the hero demigod of Polynesia, pursued the *alae*, or mudhen, to learn the secrets of fire it held in order to share the power of cooking and warmth with all people. Some of our most ancient myths revolve around the mystery, magic, and origin of fire.

Clearly to our most ancient ancestors fire was important, and it's no wonder that they attributed hero stories to its origins. What a gift! Fire brought light, warmth, heat, and the ability to cook food and later to create all sorts of new technology. A strong argument can be made that fire was the first form of energy technology ever used by humans, and that all our other energy technologies developed after this first "mastery of the elements."

There's no definitive answer, but according to current estimates, our ancient ancestors starting using fire as long ago as 1 million years. We probably started to harness and use fire to help obtain food (by setting wildfires to corral animals) and possibly to help cook food. In fact, we started using fire before we had evolved into modern-day humans. Our predecessors, *Homo erectus*, were the first to start consistently using fire, and it is likely that *Homo erectus* turned into *Homo sapiens* and eventually

“anatomically modern humans” (sometimes called *Homo sapiens sapiens*) because of fire.

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How is all this possible?

There’s compelling evidence that our ancestral predecessors used fire to cook food. Our ancestors before *Homo erectus* had a tooth arrangement that looks a lot more like other primates and apes, which evolved due to their regular diet. This means that these ancestors ate a lot more fruits and simple vegetables. As evolution continued, our *Homo erectus* ancestors’ molars shrank and their canines became more prominent. By current understanding, what this means is that they had more meat in their diet—thus the need for sharper teeth for tearing and grinding—as well as more starchy vegetables, such as roots and tubers (which require cooking to be completely digested). Essentially, the creation of fire gave these ancestors access to a lot more food and different kinds of food—foods that could now be cooked to be digestible. In fact, fire allowed these ancestors to preserve meat and other foods to be eaten over time. Cooking over a fire was one of

the most ancient human uses of fire, and it's pretty amazing that it still happens around the world today.

But fire gave us a lot more than extra calories and the ability to store food longer. The same things that we value fire for today were highly valued by our ancestors as well. For instance, one of the key things that draws people to fire is its warmth. Of course, being too close to fire can burn and cause damage, but if we are the right distance away fire can warm us and our loved ones, and help us live through temperature fluctuations. Fire may have helped improve infant mortality rates by keeping children warmer, especially through the vulnerable first couple years of life. In fact, fire allowed humanity to spread out of tropical and subtropical regions to much cooler areas north and south of the equator. *Fire allowed us to literally move and live in other parts of the world*.

Not only did fire keep us warm and allow us to live in cooler environments, it also helped us survive through the night better. While humans have pretty decent night vision and aren't nearly as helpless as we might imagine, we are still at a disadvantage compared with nocturnal animals. And don't forget that in the earliest days, humanity was surrounded by way more animals and predators than we are accustomed to now. While other animals instinctually avoid fire, as their primary experience with it is wildfires, which are inherently dangerous, our ancestors actually used fire to keep these predators at bay, especially at night.

But perhaps fire's biggest impact on human evolution is how, through our circling around its warmth and light, it allowed humans more time to develop communication and culture, social bonding, and even technology at night. It's important to remember that in equatorial regions there is consistently twelve hours of darkness every night. For protohumans and early humanity, this time was mostly used to stay safe, rest, sleep, and huddle together (except perhaps on full moon nights). But based on how we still respond around campfires in the evening, it's not too hard to imagine that at some point we started to have more time together for developing culture through song, dance, and storytelling. We also had more hours to work on projects such as stonework, making clothes and medicine, and processing food. Some anthropologists believe that fire's central place in our lives in humankind's early history had a profound effect on what we now think of as human culture.

While it’s easy to see fire as its own form of technology (after all, it is a form of somewhat controllable energy that can be harnessed for a variety of uses), it’s not as obvious that fire helped us with many other technologies. The most well-known is, of course, evolved cooking skills, including food technologies that might not be obvious. For instance, fire allowed us to smoke and dry meat, and probably other foods as well, which prevented them from spoiling and allowed us to have stored calories that could help us survive through lean times.

Fire was also used to alter, strengthen, and improve some of our earliest wooden tools. Fire-hardening is a process where wood is held over the top of a fire while gently turning it and preventing it from charring. Doing this with a wooden spear point or arrow point greatly enhances the hardness of the wood and prevents it from splintering easily. There’s compelling evidence of protohumans making fire-hardened spears as long ago as 400,000 years.

Similarly, when stone tools—such as projectile points (spear or arrowhead), stone knives, and scrapers and awls—are heated in a fire, they become much easier to fracture and flake. This greatly increases the ability to make useful, more durable stone tools. In fact, some anthropologists believe that this skill in heat-treating stone allowed humans to develop the first bow and arrow, a technological leap over spears and spear-throwers.

All of these ways of using fire are collectively known as pyrotechnology, and they were a huge help in allowing our ancestors to survive and thrive, to explore new areas, and eventually to migrate to different areas. Neanderthals also used pyrotechnology. Until recently, it was thought that only humans and our progenitors used fire as a tool. Humans and our ancestors are certainly the main users of pyrotechnology, but biologists in Australia have made a startling discovery regarding birds and pyrotechnology.

Around the world there is a curious linkage in our collective mythology between birds and fire. This can be seen in the stories mentioned earlier about Rainbow Crow flying up to the sun to catch a stick on fire to bring fire to the people or of Raven stealing the sun (the ultimate source of fire, light, and heat), but there are other examples as well. For instance, there is the tale of the mythical Phoenix, a concept originally from ancient Egypt that spread elsewhere, which tells of a bird that is continually regenerated by fire. In Russia, there are stories of a magical Firebird that appears in

folktales. In China, there is the Crimson Bird that lives in the South and is one of the four mythic guardians of the directions and the elements. It's associated with the element of fire. Finally, in Japan there are the Fire Crows or Sun Crows, red crows with three legs, associated with the sun and fire.

While this could just be coincidence or a hint at some original human universal culture, the truth may be even more astounding. Wildlife biologists in Australia have now witnessed and documented clear examples of raptors (birds of prey) actively using and spreading wildfire to flush out prey. The birds were even seen picking up burning branches and spreading wildfire to other grassy areas! They are using fire to hunt, and they are using fire as a tool.

Perhaps more wondrous is that this directly parallels local stories, myths, and legends of birds bringing and using torches of fire in indigenous Australian culture. In fact, these ancient legends are enacted in a ritualized fashion to honor the history of fire.

All this brings up the intriguing possibility that perhaps these ancient myths of birds bringing fire are rooted in actual facts and events. And it even suggests that ancient protohumans could have learned to use fire by watching and observing what the birds were doing!

While it's easy to see how influential and important fire was in humanity's earliest days, we often overlook the role it has played throughout the rest of human history. Even today, there are plenty of places around the globe where the primary way that people cook their food and heat their homes is through fire. The importance and cultural significance of fire didn't significantly decrease until the very modern era. In fact, if we peel back a layer on some of our modern cultural veneer, we can see the role fire has played in several key aspects of life: religious ceremonies, food, and protection.

For many of the most ancient religious traditions of the world, fire played (and sometimes still plays) an incredibly important role. Fire was often seen as a divine force that was personified as deities such as Agni in India, Brigid in ancient Ireland, Vulcan from the Romans, or Pele from

Polynesia. If there wasn't a specific fire god or goddess in a tradition, fire could simply be seen as a manifestation of the divine. After all, Moses received the Ten Commandments during his experience of the divine in the form of a burning bush.

The Vedas are some of the world's oldest known religious texts (at least 3,000 years old), and they contain specific descriptions of fire ceremonies known as Pujas or Homa. In India and in Hindu communities around the world, specific Pujas are still held by Hindu families and Brahmins on a frequent basis. A fire is made and offerings are given to the fire in the form of food and aromatic oils and woods, then chants are recited over and to the flames. These are held at specific times during the month, often at sunrise and sunset during exact points in the lunar cycle or based on other astrological calculations. Pujas also are used to commemorate birth, marriage, and of course death. In fact, cremation is one of the most widely practiced death rituals in the world.

Zoroastrianism, a precursor to the monotheistic traditions of the Middle East, was built on the core beliefs of one divine god, a messiah-like figure, sacred texts, a concept of heaven and hell, and the power of both fire and water. Scholars consider it to be an influence on Judaism, Greek philosophy, Christianity, Islam, and possibly even Buddhism. Fire is considered a purifying force, and both prayer and ceremony are centered around fire in this tradition. In fact, Zoroastrianism may have been the first religious tradition to keep an eternal flame—a fire that is never extinguished and is tended by religious specialists.

To this day, the practice of tending an eternal flame, either with natural gas or organic materials, is practiced in over fifty-one countries and on most continents. Modern eternal flames often serve as memorials to lost leaders, fallen soldiers, or historically significant sites.

The Kalahari Bushmen (also known as the San or Naro people) belong to one of the oldest cultures on the planet—as old as 60,000 years. Fire is central to Bushmen religious ceremony. To this day, the elders in Bushmen society (both men and women) hold sacred trance-dances around a central fire. These dances often go on all night and involve singing, clapping, dancing, and moving like animals around a fire, and the whole community participates. The dances provide healing, smooth out community relationships, and serve as the primary way that the Bushmen connect to god or the divine.

There is pretty compelling evidence that the oldest spiritual ceremony is dancing and singing around a fire in community.

These traditions continue in new and innovative forms even today. For instance, in the Native American church (a complex blend of several different traditions, with some branches having a strong Christian influence), one of the main parts of a typical religious ceremony is staying up all night with a fire. There are two main conductors of the ceremony, one of whom is often dubbed “the Fireman.” The Fireman tends the fire all night, making sure it burns cleanly, and it is their job to continually rake the coals together. In some versions of the core ceremony, the coals are used toward the end of the night as a source for scrying, or looking for portents and symbols. Predictions, insights, and reflections emerge from what is left of the fire and often serve as a key source of meaning for participants.

Fire is combined with water to produce a healing steam in many healing and spiritual systems. The most well-known of these traditions is the sweat lodge used extensively by Native peoples in North America as a place for healing, prayer, ceremony, and vitality. The folk traditions of the sauna from northern Europe and parts of Russia play a similar role historically and to this day in remote areas.

Fire kept our ancient ancestors safe from predators at night, but that’s only a small part of humankind’s relationship with fire.

Fire was the main source of heat for most of human history. In fact, besides the sun, *fire has been our only source of heat for most of human history*. Before fire, it was almost impossible for our predecessors to live in cold climates at all. Fire made it possible for our ancestors to journey into the frosty and snowy climates in the far northern and southern hemispheres. Fire was the original thermal technology that kept us alive in the cold. It still does this around the world today. In areas without electricity, fire or another form of combustion is a main heat source. Many households in remote parts of northern China are still built around an enormous clay hearth called a *kang*. It is fired with coal, wood, or other combustibles, and it keeps people warm all night long. A typical version takes up one-half to one-third of the space of a room, though other versions take up the whole

floor and use a complicated system of flues to heat the entire floor and direct smoke outside. Recent evidence indicates that this style of stove and heater has been used for at least 7,000 years. To this day, people sleep, socialize, and cook around this central fire vessel.

A similar practice still happens today in parts of Russia, Ukraine, and Belarus. Russian-style stoves are also built out of clay or stone and fed with wood. The stove serves as a place to cook or bake certain foods and simultaneously heats the house (a slow, deep, penetrating heat that takes a long time to bring up to temperature). People may sleep on top of the stove or near it as their primary form of heat. While the house is being heated against the cold Russian winter, the occupants can make porridge, bake pies, and slow-roast or smoke meats.

Most of the energy technology we have used throughout history is fire based. While our computers don't run directly off a fire in a woodstove, they run on electricity generated by the combustion of coal, oil, and natural gas. Almost all fossil fuel–based energy technology basically involves burning resources to produce heat that then is either used directly or converted into electricity or mechanical force. Fire and combustion are the basis for most of today's energy technologies. Greener forms of energy production like wind, water, and solar are departures from fire-based power. Both nuclear and geothermal energy, though, are close variations on fire technology.

If we dig deep enough, we realize that far from just being an element that armed our ancestors against environmental challenges, fire is still a core part of our lives, albeit in a more hidden form.

DELIBERATE BURNING AND BIOCHAR

One often forgotten use of fire is the deliberate burning of our landscape in managed burns. Strong evidence suggests that humans have used fire to manage landscapes for thousands of years. It's possible that the first use of fire was deliberate burning to flush out game and char wild plant foods. This evolved into a specific set of practices to burn away undergrowth and leave a landscape cleared of dried grasses, hanging dry wood, and other burnables.

WILDFIRE IN THE TWENTY-FIRST CENTURY

During the course of writing this book, the world experienced unprecedented wildfires on multiple continents and in dozens of countries, affecting the lives of millions of people. It became strange, ironic, and sometimes surreal to be writing a book about humans and fire and how to make fire while friends and relatives in different areas were struggling with the damaging impacts of fire. Even in the Pacific Northwest's wet bioregion, which I call home, we experienced devastating levels of wildfire smoke a couple of summers ago that made the outdoor air toxic. Yet all of these fire events around the world might also point to a deeper need to look at our relationship with fire; it certainly suggests we have an opportunity to examine our deeper patterns of relationship with the trees around us and the bioregions we live in.

In these same regions that now burn out of control, local Native peoples often practiced controlled fire-burning on a regular basis to create a better living environment for themselves and their ecosystems.

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In areas managed by controlled burns, mature trees tend to thrive and there is more room for wild game and animals to travel. In fact, many plant species thrive and replenish after a burn (a lot of nutrients get returned to the soil). Deliberate burning also mitigates the spread of wildfires, which can be especially devastating in areas with large fuel loads built up over centuries.

Native Californians used burns frequently to manage the land for food, natural materials, and forest fire prevention. Ironically, many of the "pristine" wilderness areas that John Muir was so fond of hiking through were places that had been heavily managed by Native peoples for centuries, including with controlled burns.

In Australia, specific areas where the local Aboriginal population had continued traditional controlled-burn technologies and practices were protected from the devastation of recent wildfires.

Fire is also, of course, integral to our relationship to food and cooking. Modern kitchens might hide heat sources within stoves, ovens, instant pots, and microwave ovens, but most of the food cooked by humans has been

cooked with fire. In fact, in parts of the world without easy access to electricity, it is still the dominant way of cooking food. Whether you're stir-frying, sautéing, baking, steaming, boiling, or frying, the original techniques were all developed over fire.

We love the use of fire for cooking so much that we go back to it even when we don't necessarily need it. Just think of the popularity of wood-fired pizza or Burger King's charbroiled burgers. World-renowned chefs prefer gas flames to electric burners. And let's not forget the classic summer pastime of cooking meat directly over flames on the backyard grill (whether it's gas or charcoal).

The importance of fire in human life hasn't changed, but our awareness of it has. We have become removed from the actual skills for and connection to making fire. While going on a journey into the ancient roots of fire is informative, we need more than an intellectual and theoretical relationship with fire. What good is it to know all this if you can't make a fire in an emergency? How can we have an immediate, connective, and intimate relationship with fire? What are the best ways to cook on a fire? And how do we do all these things safely?

Answering these questions will set you on your own path of fire discovery.

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FIRE SAFETY AND HAZARDS

Before we even begin talking about how to make a fire, it's important to emphasize that fire is inherently dangerous. It is powerful, unpredictable, and deadly. While hearing these statements might invoke images of some massive wildfire, it's important to realize that small fires are quite dangerous as well. We must respect fire, but we don't need to run from it. Fear of fire has contributed to a loss of fire knowledge. Protective instincts have taken away opportunities for kids to be around fire and learn how to interact with it safely.

As we've seen in the last chapter, wildfires are a danger, but they are also quite natural. In fact, fire suppression efforts in our national forests actually may have made forest fires worse. However, the last thing we want to do is cause a wildfire. Furthermore, we don't want anyone to be hurt by a fire, nor do we want to cause any damage to an ecosystem or human dwelling through carelessness or lack of preparation.

Key points to keep in mind with fire:

- Fire is inherently dangerous and can be unpredictable, especially in hot, dry, and windy conditions or environments.
- Fire can easily cause burns if not treated with respect and awareness.
- A person can be seriously hurt even with a small fire if they are careless.

- Fire can easily spread to nearby trees, bushes, shrubs, and even human structures if proper precautions are not taken.
- Smoke is one of the more dangerous components of fire without proper ventilation.

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Each of these dangers can be addressed and mitigated with proper precautions. Here are some key tips to make a safe fire:

- **Select a site for your fire where the fire can be contained and will not easily spread.** It can be easy to overlook this key detail. It's like the real estate saying: location, location, location. Making your fire on a sandy or rocky surface is ideal. Make sure there are no hanging branches from trees nearby. Check to make sure there is no flammable vegetation nearby where a fire could spread.
- **Make sure you have access to water, if at all possible, when making a fire (unless it is an emergency survival fire).** This is such an easy step. Have a bucket of water nearby, and use it to extinguish your fire

when you are done. Keep an eye out for any smoldering coals, and be sure to extinguish all coals.

- **Beware of root fires.** Most people are not aware that if you build a fire over tree roots (even if they are several inches underground) you can cause a root fire. When a hot fire burns for a prolonged time over the roots, they can slowly catch fire and smolder underground for days or weeks before eventually igniting the trees. I have two colleagues who unknowingly caused root fires in western Washington because they didn't know about this. Fortunately, the fires were both discovered and put out without serious harm. It's best to choose a site without tree roots (but see below for more options).
- **Build a safe fire structure that works for your site.** An ideal fire structure includes a barrier, often in the form of a stone ring around the site of a fire to contain the fire. Depending on the ground, you may have to build a floor of stone on the bottom of your ring to guard against scorching and root fires. Humans love to build roaring, blazing bonfires (maybe it's in our ancient DNA, remembering very cold winters and dark nights), but the ideal fire provides just the right amount of warmth, light, and comfort without being too big or too smoky.

LEAVE NO TRACE

Fires are forbidden or discouraged in many outdoor spaces, especially wilderness areas and national parks. Fires can bring about unwanted changes to the ecosystem and cause big impacts in such areas, even if done carefully and appropriately.

Follow local regulations, check land management rules, and keep fire-making to private land, campgrounds, and recreation areas with established fire rings.

Some of the impacts that you might not think about when making a campfire include trampling off-trail when gathering wood, creating large areas barren of wood, damage to trees caused by axes and saws, and large, messy fire pits full of garbage, charcoal, and burned food.

It's important to ask questions about fire danger, local restrictions for fire use, the sufficiency of wood in the area, and how easy it is to access that wood. Is it possible to create a fire that leaves no trace?

Follow these guidelines to minimize your fire's impact:

- Use existing fire rings and keep fires small, burning only for as long as necessary.
- Allow wood to burn all the way to ash.
- Try not to create fire scars on the land, especially on rocks.
- Try to use dead and downed wood; do not break or chop wood off live parts of trees.
- Gather wood from a wide area.
- Burn only wood. Do not burn trash, especially plastic or foil.
- At the end of your fire, soak it with water and scatter the remains (or bury them if completely cool).

FIRE SAFETY

These pointers will make your fire safer and protect the experience of other users in the future.

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Make sure there is plenty of ventilation where you build your fire.
Most of the fire-making we are talking about here will be done outside, but we still need to be mindful of smoke. Smoke is often inherently toxic, more so with certain woods (like pine). Build a fire inside a structure only with a proper fireplace or woodstove for containment and a proper chimney to draw smoke up, out, and away. Carbon monoxide is an odorless, colorless gas that can come out of fires under certain conditions and can cause illness or death without proper ventilation. In outdoor situations, carbon monoxide is rarely a problem unless you build a fire inside a structure or tent. This is not a good idea and takes expert knowledge beyond the scope of this book. (The one exception I will mention is if you are using a tarp or a lean-to shelter and one side is completely open air, then it is safe to have a fire for warmth and protection.)

Fires often spit out embers, coals, and even hot sap.
Just because a fire is contained with a good fire ring and you have a sound structure does not mean the fire is completely safe. Fires do pop, crackle, and send pieces of themselves flying, especially with certain woods. Many varieties of cedar are prone to spitting, as are sappy woods, which can spew out hot sap while being burned. Do not sit, lie, or sleep too close to a fire, and do not put your face near the flames.

Pick fireside activities carefully.
Many people love to dance, sing, play, and drink around a fire. Keep in mind that rough-housing, consuming alcohol, wrestling, and the like too close to a fire can easily lead to an accident. A body part in the fire will quickly ruin the fun.

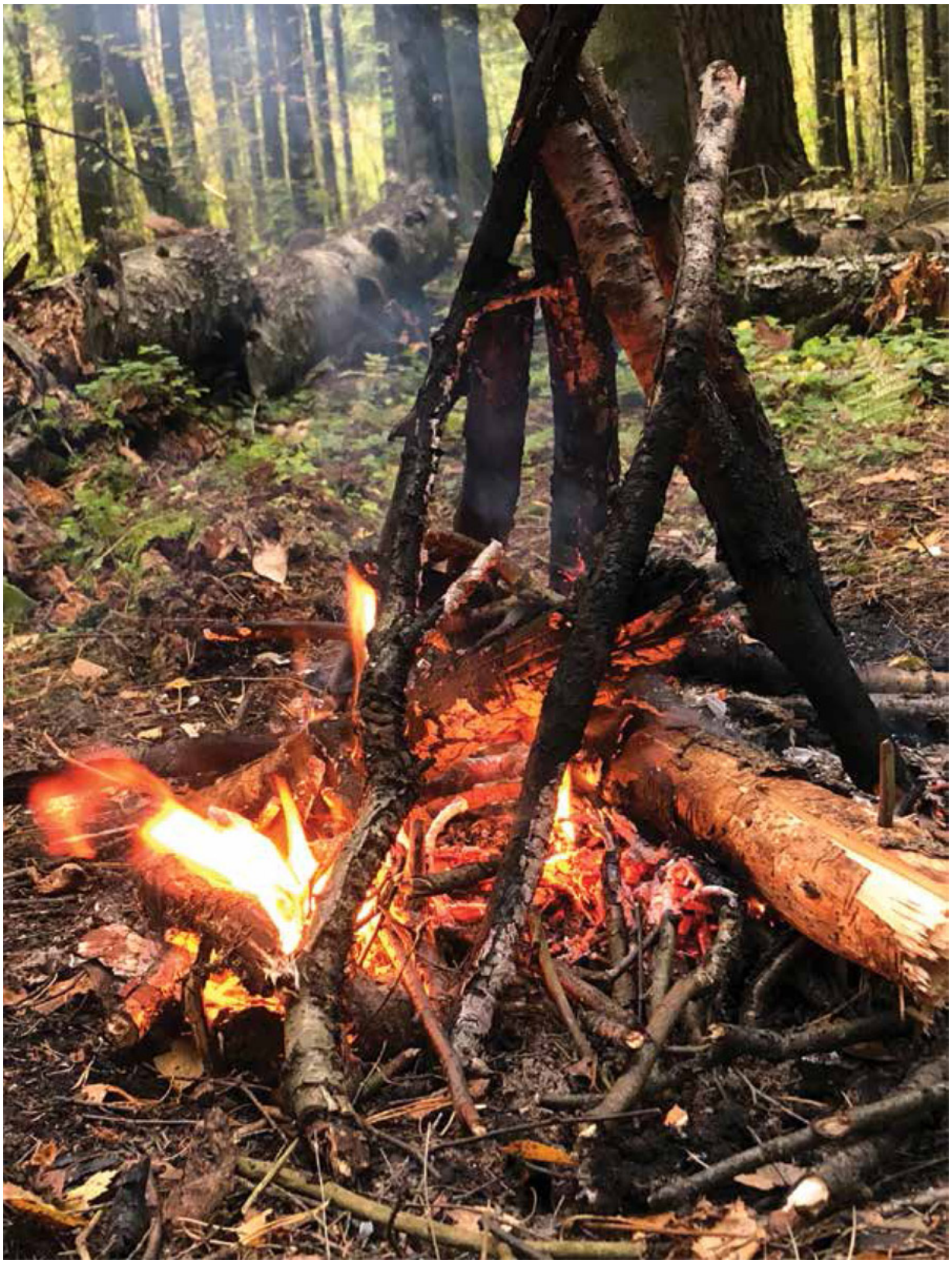
If you put something in a fire, it will get hot and eventually catch on fire.
Most of the minor burns and near-miss accidents I witness near fires occur when people are cooking on a fire or coals, or they are putting something into a fire and then taking it out. Keep in mind that anything that goes in a fire gets hot and can then spread that heat or fire when taken out. It’s best to not put anything in a fire other than wood or cooking utensils.

While the above points are true and important, let's remember that we've been using fire to help us in our relationship with nature and the elements for possibly as long as 7 million years. Humans do know how to be around fire safely and not harm themselves or their local ecosystem. Tread carefully, use caution, and respect fire. But don't let fear of practical risks keep you from reclaiming this relationship.

I have been around hundreds if not thousands of fires with people of all ages, including babies and preschool-age kids. All you really need for a safe fire is a safe fire ring, a safe location for the fire, clear safety guidelines, and water. In all my years as an outdoor survival-skills instructor, I've never seen or been part of a serious fire injury. Though I've seen some minor burns from carelessness, I've never had to take anyone to the emergency room for a burn. If you follow the above tips, you can confidently keep yourself and your family safe around the fire.

FIRE-TENDING

In many cultures, starting, taking care of, tending, and perhaps even putting out a fire are considered important and sometimes sacred duties. There may be specific requirements or restrictions on who can or should tend a fire, and how and when. All this points to the idea that creating a fire and taking care of it appropriately requires skill, experience, and knowledge. Tending a fire is something I encourage everyone to practice. It requires patience, awareness, and a fair amount of experimentation to figure out what works (especially with different woods and conditions). Being able to keep a fire going under challenging conditions such as rain, cold, and snow, and keeping a fire safe under windy, hot, and dry conditions, require artful skill. Practicing with small fires and learning to use different sizes and kinds of wood are great ways to develop these skills. I encourage everyone to undertake the art of tending fire. It's a great way to develop a powerful relationship with one of humanity's oldest teachers and mentors.



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ESSENTIAL COMPONENTS

Not long ago I was teaching a class on the Big Island of Hawaii about natural mentoring, survival, and free-range parenting. Fire-making was one of several tools we used as an example of how to learn from and work with nature for both kids and adults. My friend and co-teacher Mariah had brought in her colleague Paolo for the class, an expert in the local materials and skills of making fire on a tropical island.

Paolo and I quickly bonded and connected over being dads and survival-skills teachers, and having lived in similar places and communities. I was impressed with Paolo's fire skills but also loved his teaching style. For Paolo, fire was a good teacher and mentor, and he often set students up for powerful lessons with fire by giving them basic instructions and then letting them try repeatedly to get a fire going with matches and local natural materials. He wasn't afraid to let students fail, as he saw their "failures" as just more practice time that taught valuable lessons.

The site where we held the class that weekend was called a cloud forest, but honestly it felt more like a rain forest. We had several torrential downpours throughout the day. Even though I was with a group of seasoned survival instructors, many of whom had cut their teeth making fire in the damp and rainy Pacific Northwest, we were all finding the conditions pretty challenging.

On one of the evenings of the class, we had left it up to the students to make the fire for our after-dinner activity. After almost an hour, it became clear that the students were struggling in the damp, wet, and actually quite chilly conditions, even with the extra-dry material Paolo had brought. Finally, it became clear that if we were going to have a fire that night, the instructional team would need to jump in. At first, we tried using the students' fire structure and material, but we soon realized that was not going to work. Paolo suggested we start from scratch. We followed his lead by setting up a solid fire structure *using all the key components needed for fire*. With that design we were able to quickly get a two-match fire going (which really should have been a one-match fire, but I dropped the first match and let it go out!), which roared to life and provided much-needed warmth and light for the entire camp!

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In this chapter, you will learn exactly what components you need to make a successful fire, just like we used in the above story, and I will also provide key pointers to troubleshoot difficult situations.

KEY COMPONENTS

A lot of people don't know the key components of a fire—the things you need to get a fire going under almost any conditions, and to keep it going. The key components of a fire are:

- Ignition source (how you get the initial flame or spark)
- Tinder (dry, light, fluffy material that is easily ignitable)
- Kindling (small, pencil-sized or smaller wood, branches, or similar material)
- Fuel (bigger wood, from finger or bigger sizes all the way up to firewood)
- Oxygen (possibly the most important, though often forgotten, component to keep your fire going once it's started)

Let's take a deeper look at each of these.

IGNITION SOURCE

There are a huge number of ways to get a spark, flame, or coal in order to start a fire, but some of them are easier, more convenient, and more helpful than others. Some require specialized skills, lots of practice, and much work. However, sometimes the highly specialized methods of igniting a fire may be the most useful in an emergency situation!

There are two basic forms of ignition sources: mechanical, modern ones and older, more historical or antiquated ones. A good example of a modern, mechanical source is a lighter. A lighter easily produces a flame under most circumstances and is pretty reliable and foolproof. It is also almost impossible to make on your own, and its creation requires high technology and easy access to fossil fuel resources.

An example of a historical form of ignition is flint and steel. This method uses a striker made out of steel (sometimes just a knife) and a piece of flint. The two are struck together to produce a spark that can then be caught in a char-cloth (a piece of cotton that has been turned into almost a form of charcoal) or possibly in super-fine tinder. Each of these has advantages and disadvantages. A lighter can break and eventually run out of fuel. Flint and steel won't break, but they require skill and multiple pieces of equipment to work.

The modern, mechanical methods are lighter, fire-striker, magnesium striker, and magnifying glass. Historical methods are flint and steel, hand-drill, bow-drill, fire-plough, pump-drill, mouth-drill, and bamboo fire-saw.

You might have noticed that there's a rather obvious ignition source missing here: matches. Matches, in my mind, are a great example of a hybrid of ancient and modern technology. They have been around for centuries (since 1805), and they require some form of technology to create. Yet they are not highly mechanical, don't malfunction from mechanical breakage (you can still light a broken match), and can be used under a variety of conditions.

WHERE DO MATCHES COME FROM?

An early predecessor to the match, combining sulfur and pinewood, was used in China as early as the mid-fourteenth century. These highly flammable little sticks were useful fire starters. Starting in the early 1800s in London, a series of different chemical-based matches were created to help light pipes, tobacco, and even streetlights.

John Walker, a chemist in England, accidentally created a match that could light with friction in 1826. He used small wooden splints tipped with a combination of chemicals that included varieties of sulfur, potash, and some camphor. Over the next fifty years, variations on Walker's friction matches were created with various chemical combinations and different degrees of success. Early white phosphorous matches were found to be toxic, so the white was replaced with the safer-but-pricier red phosphorus. An American by the name of Joshua Pusey created a friction match in the 1890s that came with a striking surface on the box. He sold the patent to the Diamond Match Company, and finally friction-based, nontoxic matches were manufactured and sold on a mass scale.

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In the next chapter, we will look specifically at all of these ignition sources, including their advantages and disadvantages.

TINDER

It's easy to overlook this essential component of bringing fire to life. It's hard to say which is more important: the source of ignition that brings the first spark or the matrix of materials in which that spark is put to keep it alive. If all this sounds a little mystical to you, you're not alone. For many people throughout time and place, bringing fire to life is akin to magic, or the start of life. In some cultures the spark or flame of ignition is the masculine component of making fire, and the first materials the spark is put into is related to a womb or a nest to protect the beginning of this precious life.

Tinder is the bed of light, fluffy, dry plant material that's the first to be lit with either a match, lighter, or other source of ignition. A coal you've created through friction fire may also be placed into a bundle of tinder.

I’ve made the mistake time and time again of having an excellent ignition source or even doing the really hard work of bringing a coal to life through friction fire only to have it fizzle out because my tinder was inadequate. In ancient times, people probably collected, stored, and carried some form of tinder with them everywhere. This is because if the weather becomes inclement it can suddenly become much harder to find and work with tinder. Start to look for tinder wherever you go. If you find a good source, carry some in a dry container in your daypack with your other survival gear.

Generally speaking, tinder can be almost any form of dried material from a plant, tree, or bush, though some materials work better than others. For instance, dry dead grass can work well as tinder. But even a little bit of wet green grass mixed in can make getting your fire started much more difficult. Dead, dry leaves are pretty difficult to work with unless you crush them into small, powdery bits.

Some of the best tinder you can find in nature includes:

- Dry, dead grass
- Shredded inner bark of certain trees such as cedar, cottonwood, and juniper
- Outer bark of certain trees such as juniper and birch
- Fluffy, cottony material from different plants such as cattail fluff, dried mullein, dried sagebrush leaves, dried milkweed seeds, or cottonwood seeds
- Pounded dried fibers from plants such as agave, nettle, or dogbane
- Certain forms of shelf fungus such as tinder fungus and chaga

In general, look for light, dry, fluffy material that would be good to make a nest. In fact, making a nest shape out of your tinder is perfect if you are making a friction fire. Harvesting, gathering, playing with, and experimenting with various kinds of wild tinder will help you develop essential survival skills.

Plenty of human-made materials make great tinder as well. Paper is probably the most well-known one. Sawdust or wood shavings, dry, shredded cotton cloth, and even dryer lint can also do the job. Exercise your creative ingenuity and consider what you are carrying that could be used as tinder.

KINDLING

Kindling is the small pieces of wood that will ignite directly from your tinder and actively get your fire going before you add bigger pieces of wood. I still remember my mom sending me out to gather kindling (basically sticks) to make a fire in our fireplace. This was a chore just as integral for a single mom and a super-energetic kid then as it had been for generations and centuries. Kindling can be any nontoxic stick about the thickness of a pencil and arm length or shorter.

One common mistake is gathering kindling from the ground. While this can work, often wood of any kind on the ground is at the very least damp and has absorbed a lot of moisture. While this is definitely the case in the Pacific Northwest, it can also be true even in the desert or mountains. Damp or wet kindling is not only hard to light and get going, it also produces a lot of smoke. So here's a pro tip: If possible try to find dead, dry, hanging branches on trees. This provides you with excellent kindling and also does the forest a favor by clearing out the flammable hanging material that enables forest fires to spread. In fact, there's a story of a forest fire that burned *around* the woods near a survival school in New Jersey because all the kindling and debris in the area had been gathered for so many years that the fire danger in those woods was actually lower than the surrounding area.

To summarize: Kindling is pencil-sized or close to pencil-sized, dead, and dry and ideally hanging off the ground.

FUEL

Fuel is your bigger-sized wood, and probably closest to what most of us picture firewood looking like. Fuel is more likely to be wrist to arm width and the length of your arm. This is the wood you add to a fire after it is burning well from your tinder and kindling. Start by adding smaller pieces of fuel to your fire or fire structure before adding the really big pieces. If you have access to perfectly sized, dry firewood, that's great. We don't have woodsheds with split wood on hand in nature, though. Practicing building fires with firewood from a woodshed can help you develop an understanding of what works or doesn't work with your kindling and fuel. However, the fuel you find in nature will not be perfectly cut sections of logs that stack perfectly in your fire ring.

Finding fuel in the wild can be difficult if you don’t have a saw. Using a knife to cut large pieces of wood into smaller pieces is tricky and potentially dangerous. However, with a little searching you should be able to find dead, dry branches that are significantly bigger than kindling to add to your fire. Because fuel pieces tend to be bigger and thicker, you don’t necessarily have to get them off trees. In fact, it’s pretty hard (but not impossible) to find hanging dead wood the size of fuel in trees. But, because you are adding it to your fire once it is going, a little moisture won’t prevent it from burning. Extremely wet wood, though, will produce quite a bit of smoke. Generally, fuel or kindling branches snap when you break them. Otherwise, the wood is too green; it won’t burn well and will produce lots of smoke. We’ll learn more about this later when we talk about aging firewood.

OXYGEN

This is an often forgotten component of fire-making. One of the things I see beginners do time and time again is add too many materials to their fire and smother the young flame. You also see people build dense fire structures that leave little chance for oxygen to get in and feed the flaming tinder. Without air, the kindling has little chance to catch on fire. People also often add their fuel too early, and the heavier fuel wood knocks the kindling and tinder down and smothers the flame.

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Fire needs air, and it specifically needs oxygen to ignite and to continue burning once it's lit. Of course, too much air, blown too rapidly, can blow out flames as well (think of blowing out a birthday candle or wind blowing out a match). It's also important to remember that fire essentially goes up, meaning that heat rises. Most fire structures take this into account by having tinder on the bottom so that as the flame burns and rises, it will ignite the kindling and fuel above it. However, if you smother the flame with too much fuel or densely packed kindling, the fire can't go up. It's a delicate balance.

Once you have a fire going with kindling and fuel burning, air can bring a failing flame back to life. If flames die down or go out, you can often bring them back to life by breathing on them. In fact, sometimes in damp or wet conditions you will need to blow continuously on your hot coals to keep reigniting your kindling and fuel. It can be grueling to keep a fire going under these conditions, but the effort is well worth the heat, light, and comfort the fire can provide against the cold, wet, and damp.

PUTTING IT ALL TOGETHER

The ignition source gets a small flame or coal going, which ignites your dry, fluffy, light tinder, which then ignites your pencil-sized, dry wood kindling. After the kindling really catches, add arm-sized or bigger fuel pieces. Don’t forget airflow and oxygen in all of these stages. This formula should help you begin to make fire successfully.

Later we will look more in-depth at fire structure, style, and design, which determines what kind of fire you will have.

IGNITION

Let’s look at how the different ignition sources work and their advantages and disadvantages.

LIGHTER

A lighter is something anyone wanting to be able to make fire should learn how to use safely. It’s portable, lightweight, produces a flame (which most sources of ignition don’t actually do), pretty affordable, and probably your best bet to get a fire going under most conditions. However, there are other things to consider when using a lighter: They break, they can explode or easily burn your finger if kept lit too long, they use fossil fuels, they are often made of plastic, and though disposable, they are usually not refillable, and they don’t work very well if they get wet.

Most lighters use a miniature form of flint and steel combined with liquid gas to get their flame going. Lighters are a great place to start on your fire-making journey and are an essential piece of outdoor survival gear. I recommend purchasing a higher-quality lighter that is made of mostly or exclusively metal and can be refilled, rather than a disposable one. I also believe that anyone seriously wanting to learn to make fire *needs to get proficient in at least one other method*.

MATCHES

Matches are the number-two method of igniting a fire that everyone should learn to use effectively. A precursor to matches that involved a small sliver of pine wood coated in sulfur was used hundreds of years ago in China. Modern matches have been around since 1805. Matches are small pieces of very dry, combustible wood with a chemical tip. When these tips are carefully but rapidly struck against a striker (usually included with the matches), the friction ignites the chemical tip and produces a flame that can then be used to ignite tinder, kindling, or a fire starter. Matches are relatively easy to use, lightweight, portable, and relatively safe (they don't explode, though if used carelessly a whole box could catch on fire).

Their major downside is that they don't function very well if they get wet. This includes waterproof matches. My experience with most waterproof matches is that they don't actually work well in true waterproof conditions. Also, the striker can wear out after a while and become difficult to use. The ideal one-match fire means you strike one match into flame and use that lit match to bring your entire fire structure to life. Learning to make a one-match fire is an excellent skill to hone.

FIRE-STRIKER/MAGNESIUM-STRIKER

I grouped these two together because they are basically the same design. These modern-designed tools consist of a solid, soft metal bar (often made of magnesium) and a piece of harder metal to use as a striker. In some ways, this is a modern form of flint and steel with a softer metal used instead of flint to throw a spark. What's nice about these strikers is that once you get the hang of them, they produce a lot of sparks. Basically, you forcefully and rapidly strike the key (hard metal part) or the back of a knife against the metal bar. This produces sparks. However, unless you have dry, fluffy tinder ready to catch the spark, a striker won't do you a lot of good.

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FLINT AND STEEL

This method has a long history, though there isn't a clear idea of how long it has been used. Basically, this method involves striking a piece of steel against a piece of flint (a type of stone). This produces a strong spark that can ignite the right kind of tinder. However, it does not produce a lot of sparks like the fire-strikers described above do. A char-cloth is the best tool to catch and ignite a spark. This is cotton cloth that has been prepared by placing it inside a sealed metal container and setting it on fire. This process turns the cloth into a lightweight form of charcoal that can catch a spark and ignite.

The char-cloth burns slowly once ignited and can be combined with more substantial tinder to create a fire. Making fire with flint and steel can be a satisfying skill to develop, but it is a skill. It takes a lot of practice and a fair amount of equipment to pull off. This method, or some variation of it, was widely used historically in pre-modern times by many different people.

It’s popular these days in mountain men groups and other historical reenactment groups.

FRICTION FIRE

This is probably the most ancient form of fire-making that our ancestors used. While there is plenty of evidence that humans used fire from lightning strikes and other natural sources for a long time, it’s likely that friction fire was the first method we were able to use to reliably make fire. There are many different friction fire methods, including some rather exotic ones. The three main methods of friction fire discussed here are hand-drill, bow-drill, and fire-plough.

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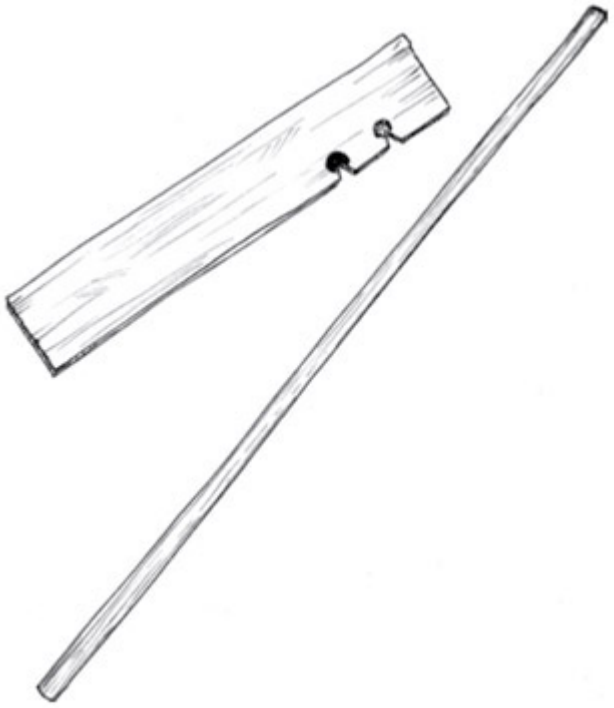
The hand-drill is probably the most common method of friction fire in the world, both historically and in current use. It is literally a method of rubbing two sticks together to produce a fire. The two pieces of wood used vary from region to region, but the basic design involves a light, thin, round drill about the diameter of one’s pinky finger and a flat, rectangular

fireboard into which it is drilled. To make a hand-drill fire, take your fireboard and lightly carve a small X or square about the same diameter as your hand-drill near the edge of one of the long edges of the fireboard. Then place the board on the ground and hold it in place with either a foot or your knees. Rotate the hand drill between your palms using a rapid back and forth motion that looks like you are rubbing your palms together to warm them up. As the point of contact between the hand-drill and the fireboard starts to heat up, start to gradually move your hands downward, applying more pressure as you go toward the base.



Once you reach the bottom, place your hands back at the top of the hand-drill, making sure the drill and the board do not disconnect. (This is tricky and takes practice and skill.) Repeat this process over and over until you start to drill into the board. After a small socket hole has been created, carve a notch between the socket and the edge of the fireboard to allow the dark dust that has been created to spill out onto the ground or onto bark or tinder. You know that it’s time to create your notch when the hand-drill has smoked quite a bit, and you have at least some dark brown or black dust.

This dust will eventually collect, condense, and turn into a coal. Repeat the process again and again, creating more friction, heat, smoke, and

eventually a small coal. It helps to have a small piece of bark or other wood to catch the coal beneath your fireboard.

Once you have a coal, you can very, very carefully lift it up with your coal catcher or a knife and place it into a waiting tinder bundle. Then it is gradually blown into flame and placed into an existing fire structure to create a fire!

Hand-drill takes a lot of practice and skill to master. Depending on where you are, it may be more or less of a realistic skill to develop. In drier, warmer desert regions or conditions, hand-drill is certainly easier. It is liberating to be able to walk into an environment and literally gather two sticks and create a fire. However, in cold, wet, and damp conditions it takes a lot more skill, the exact right materials, lots of practice, and potentially a lot of luck to pull off. Hand-drill also is a great team method to make a fire, with people taking turns at the drill to create continual friction and pressure to form a coal.

I can count on both hands the number of times I've gotten a solo hand-drill fire with a kit I harvested myself. This probably surprises a lot of people who assume that because I'm a survival-skills instructor and I've written a couple of books that I'm a fire-skills master and can walk wherever I want, break a couple of sticks off a tree, and make fire. While I have done something similar to that once or twice (in the Desert Southwest, mind you!), most of the hand-drill coals I've made have been as part of a team. In this method people take turns holding the fireboard and applying downward pressure on the hand-drill. It can be done in teams of two, three, four, or more.

This is, of course, in contrast with the image people have in their mind of the totally self-sufficient survival-skills expert who can walk into the wilds alone, with nothing, and thrive.

I want to share a story that was passed down to me by a tracker and survival-skills expert from the Four Corners area. The man was invited to help start the fire at a Native tribal ceremony. In preparation, he practiced his hand-drill extensively every day leading up to the ceremony. He got quite proficient.

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On the day of the ceremony, he was invited by the elders to help start the fire, and in response he quickly busted out his kit and proceeded to sweat and huff and puff, and after much exertion produced a sizable coal to be put in a tinder bundle. The elders and the other fire-starters (whom he had failed to realize were part of a team designated to start the fire) looked at him like he had three heads. While he was still breathing heavily, a team of four men sat in the four directions, gently said a prayer, and then took turns making a hand-drill rather quickly, with no one sweating, breathing hard, or "catching the glory" of the moment.

The tracker and survival-skills teacher was chagrined and learned his lesson. The next time he came to the ceremony he sat in with the fire-making team, and in a relaxed, enjoyable, and meditative manner helped make the coal to start the fire.

Of course, hand-drill use looks different among different peoples and in other parts of the world. Here are some stories from my colleague Roy Ashton about his adventures with hand-drill in its original birthplace: Africa.

WORKING WITH THE HAND-DRILL IN AFRICA

Having learned about friction fire while living in the USA, I moved to South Africa where I've now lived for over a decade. Hand-drill has always been a passion of mine, although I wasn't good at it until, one day, I had the opportunity to visit some Kalahari Bushmen. I realized I'd learn more from them if I had mastered the basics, so before my trip I gave myself blisters for months practicing until I could consistently get a coal. When I arrived in the desert to visit the Bushmen, two old men (one in his 80s) walked a few meters into the bush and cut a living stem of green wood from a small bush. They then stripped it of bark, and laid it on the ground while they went to collect a specific, easily shredded dry grass for tinder. Taking turns to twirl the stem, they proceeded to magically make fire using green, living wood. I couldn't believe my eyes.

It was normal for them, however, and although it took some effort, they didn't think it was unusual. Unlike Westerners, the Bushmen don't see fire-making as something to boost their egos, and they don't make a competition out of it: They always help each other, each person doing a few twirls down the stem before swapping. Nor is there any kind of hurry to show off their skills: The point is to get a fire—not to do so quickly—and sometimes it takes them a while, despite their ideal dry conditions and often perfect wood.

On another expedition, in eastern Africa, I spent time with a group of hunter-gatherers who, at that time, still habitually used hand-drill every time they lit their fires, particularly when out hunting. They carried their fire drills mixed up with their arrows, all held in one hand. They didn't bother carrying the hearth stick, preferring to pick up a seemingly random piece of wood as needed. They loved to smoke, so they got a lot of practice with hand-drill. Imagine having to drill out a coal for every rolled cigarette! One old man made a coal with just two twirls down the hand-drill stem. When I pointed this out, he shrugged, as it had never occurred to

him that it was impressive. In his culture, 8-year-olds routinely make hand-drill fires.

When I made a bow-drill set to show the kids there, there was an eruption of excitement while they all had a go, but it lasted only 5 minutes before they all agreed hand-drill was so much easier.

Unfortunately the hand-drill is a dying skill in rural Africa, and most cultures have abandoned it. Ironically, as a European white guy, I have taught hand-drill to excited kids and adults from ten different African tribes keen to rediscover their own heritage. Friction fire lights up the eyes of everyone, no matter their culture! And with careful wood selection, it's easy to make an ember with three—or even fewer—twirls down the stem.

As a wilderness guide leading overnight trails in the African bush, I regularly camp under the stars unshielded from the roaming lions, hyenas, and elephants. With my groups, I light all our campfires with the hand-drill from locally collected woods, my favorites being African wild fig, myrrh, and mongongo. I prefer to shape the holes and notches with stone tools, and crumbled elephant dung forms the center of my tinder bundle.

—Roy Ashton, wilderness guide, South Africa

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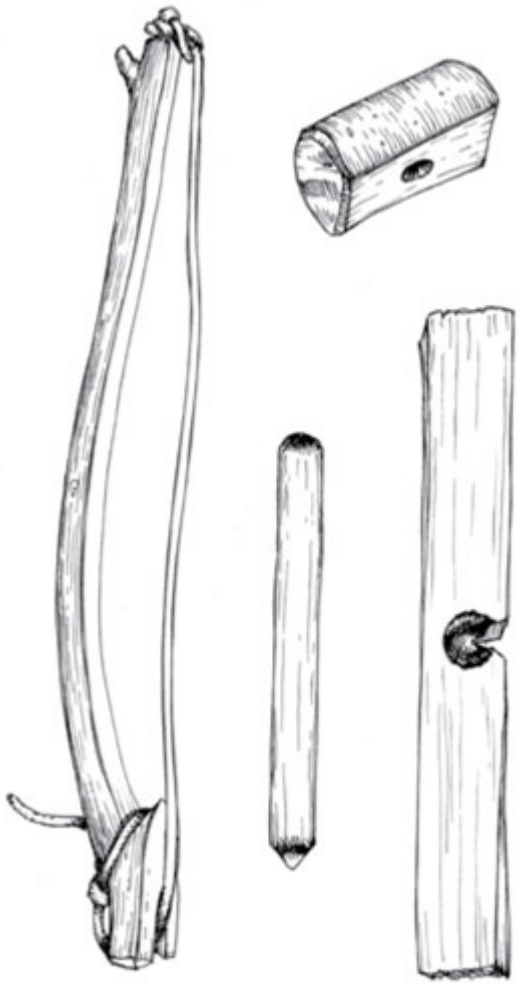
BOW-DRILL

Bow-drill is probably the best-known friction fire method. It also may be one of the easiest to do. There are debates about where and when bow-drill was invented and used. One factor that makes it difficult to date friction fire use is that wooden tools don't last over time. I've even heard some people say that Boy Scouts invented the bow-drill. Recent evidence shows that the bow-drill was used, at least in North America, hundreds if not thousands of years ago, and there is evidence of its use in much of the world in pre-modern times.

To successfully make a bow-drill fire, you need several pieces of equipment. Just like with hand-drill you need a fireboard, though usually the bow-drill fireboard is thicker and bigger. You also need a spindle that will rotate back and forth in the fireboard similar to hand-drill; again, the spindle needs to be thicker, probably as thick as your thumb or thicker.

What’s different about bow-drill is that instead of rotating the spindle back and forth rapidly with your hands, you place the spindle inside a piece of rope or cordage attached to a mini bow (a curved piece of wood)



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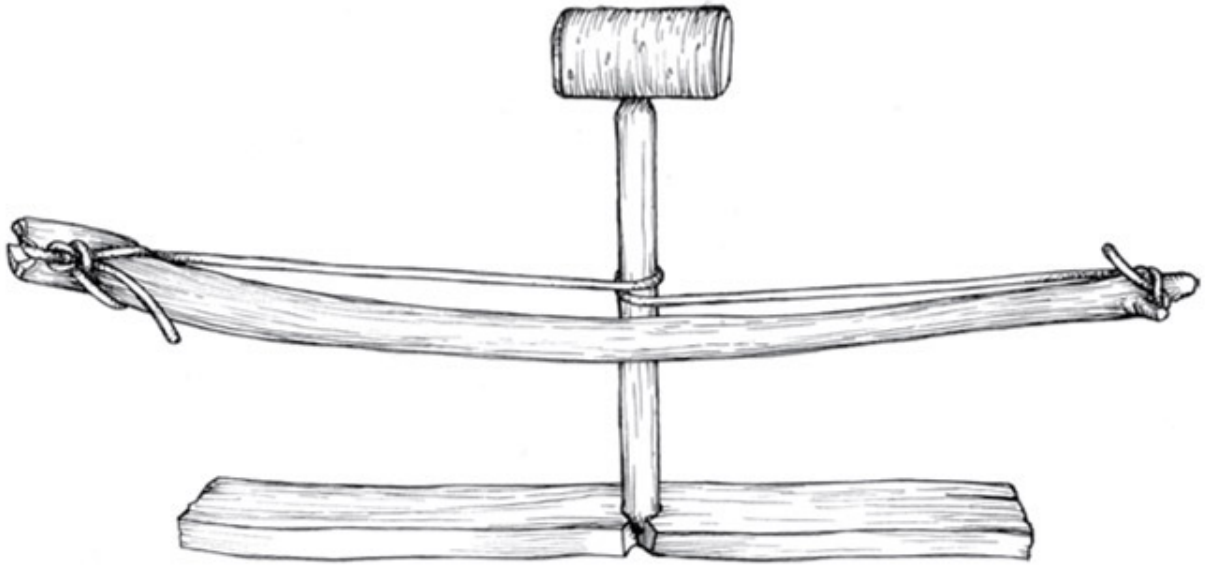
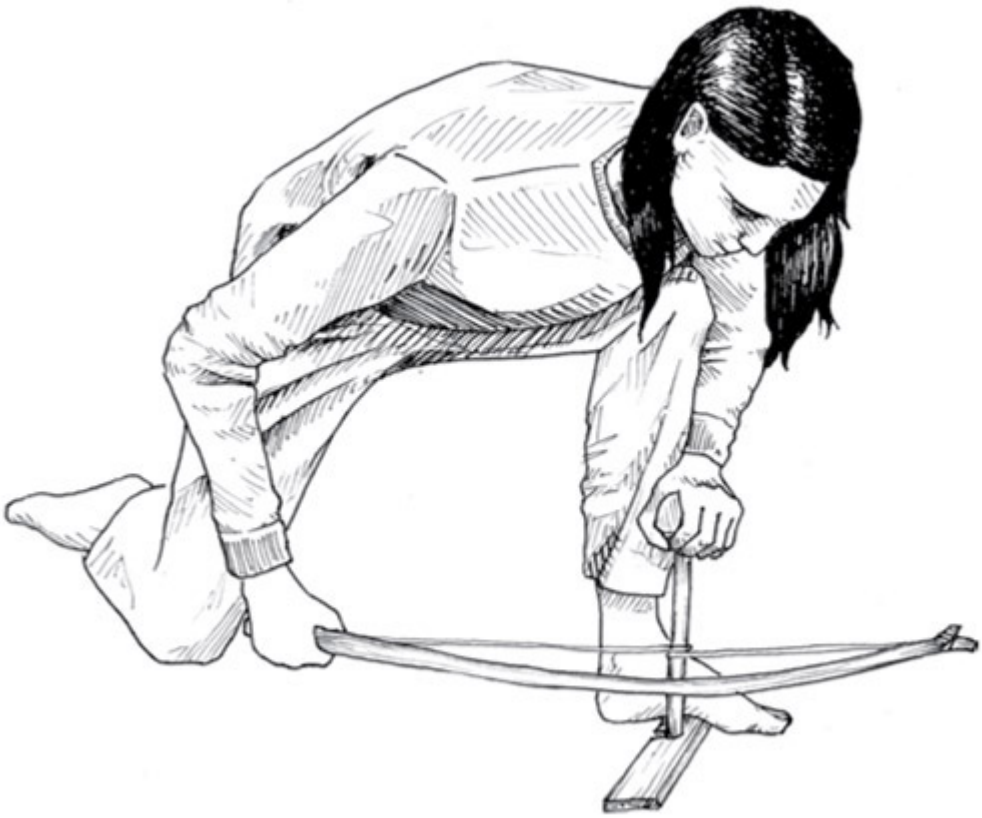
with a small section of rope attached. You then hold the spindle in place with a handhold made of hard wood, bone, antler, or a similar hard material that will have very little friction when you place something against it.

Hold the spindle in place by pressing down with one hand on the spindle, and begin to slowly crank your whole arm back and forth as the spindle stays in one place and begins to rotate. Gradually build speed, making sure to take long strokes with your arm but placing enough pressure on the spindle to keep it from popping out (this is tricky and takes practice). As the spindle rotates back and forth rapidly, friction produces heat and smoke. Similar to hand-drill, after you have drilled into your board a certain depth (about a quarter inch), you cut a notch so that the dark, hot dust you are creating can spill out. As you resume bow-drilling, the dust starts to pack together and create a coal. You add this coal to a waiting tinder bundle and blow it into life, then put it into an existing fire structure.

Bow-drill takes multiple pieces to create, and it does take quite a bit of practice. However, it is something that almost everyone can learn to do. I've seen kids under 13 become quite proficient at making bow-drill fire. I've also seen quite a few senior citizens get bow-drill fire. It requires physical skill and practice, but it doesn't need the brute strength that is sometimes required with hand-drill. For most people, bow-drill is an easier skill than hand-drill. I've also seen and been able to make bow-drill kits that can create a coal in less than 30 seconds . . . so pretty dang effective.





One of the disadvantages of bow-drill is that it requires many pieces to work. Typically you need to carry those pieces with you. You can, however, make a bow-drill kit directly from the land, and this is an excellent project to undertake. You can use a knife and a piece of cordage to create your kit, or if you want a full-on challenge, break a piece of rock to create a basic stone knife and use tree roots or vines as the cordage for your bowstring.

FIRE-PLOUGH

Fire-plough is an interesting method of fire-making that has been quite common across Oceania and Pacific Island cultures. It's quite simple, using only two pieces like hand-drill, but it takes a lot of physical strength, endurance, and the right materials. With fire-plough you need a thick but relatively soft fireboard. Your plough is a piece of harder wood that is smooth and long and about the thickness of one of your fingers. Instead of rotating the wood back and forth between your hands, you push down on the stick and move it back and forth horizontally, not losing contact with the board. This creates a little trench in the fireboard. You eventually start to favor pushing away from you, more to one side of the trench (the side away

from you), and dust will accumulate there. Gradually, the dust starts to darken and will form a coal if enough pressure and speed are maintained.

Fire-plough is extremely difficult to do by yourself unless you are literally sitting on a log, because it is difficult to keep your fireboard from moving (with bow-drill and hand-drill you can use your foot or your knees to keep it from moving). Certain woods from the South Pacific lend themselves well to this method, and I've seen certain woods from the Desert Southwest that would probably work (cottonwood and yucca or seep willow). However, it is an advanced skill that requires a lot of strength to make happen. This method was what Tom Hanks's character used in the movie *Cast Away*.

FIRE STRUCTURE

When people think of making or using fire, most of the thought and energy goes into how to get the fire started. Some thought may go into making sure you have enough fuel or material to burn, but I've found that one of the biggest knowledge gaps is around fire structure. It's something I still learn about every year from friends, peers, teachers, and perhaps the best mentor of all: fire itself.

Why is fire structure so important?

To put it simply, if you don't have a good fire structure, it's very easy for your fire to go out. And even if it doesn't go out and you have a crummy fire structure, it will produce lots of smoke and you will have to put in tons and tons of energy to keep the fire alive. This makes things like cooking on the fire and simply enjoying the fire difficult.

Thankfully, knowledge about fire structures is being revived through the broader interest in survival, bushcraft, and back-to-the-woods skills.

In this chapter, we will look at several different fire structures, including some common ones and some quite exotic ones. We will see how each has different uses and strengths and weaknesses. Knowing how to make several different styles of fire structures and when to use each is a great piece of bushcraft and survival-skills knowledge.

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A-FRAME

The A-frame fire structure isn't the most common, and might not often be the most practical choice. However, it's a great structure for beginners to practice with. It circumvents some of the common challenges people encounter when first building fires. It's also the first fire structure I learned in my late teens. I distinctly remember when I was 19 years old getting my first one-match fire with an A-frame fire structure (on a side note, my daughter Katie got her first one-match fire when she was 10 years old; I must be doing something right!).

The A-frame fire is easy to create. Simply take two medium pieces of firewood or fuel and lay them down with their ends touching at an angle that makes a V-shape on the ground. You can also use two medium-sized branches if that's all you have. This V will form the sturdy, stable part of your structure and prevent everything from collapsing in on itself (one of the most common challenges beginners have with making fire).

After assembling your V-structure, lay kindling across the V. The first piece or two of kindling will actually turn your V-structure into something resembling the letter A. This is where the name A-frame fire comes from. Continue to lay pieces of small kindling across the V, adding more and more lines to your A-shape.

Be sure to leave spaces between your kindling to allow proper oxygen flow once the fire gets started. Next, place the tinder underneath the kindling on the ground. Be sure to put plenty of tinder underneath the kindling in order to create a good flame once you ignite. Now ignite the tinder. If the materials are dry and well selected and your fire structure is built properly, the tinder should light quickly and then catch the kindling above it quite easily. Keep adding kindling across the A-frame, and once the fire is going you can even crisscross some of your kindling as you add it. Be sure to leave space so there is plenty of oxygen flow and the fire can breathe.

Once the kindling is going strong, add more pieces of wood across the frame structure or even standing up around the A-frame (which starts to turn your fire structure into a tipi-style fire). This structure also works well if you have lots of kindling and not much fuel or firewood.

Strengths: Easy to make, good for beginners, won’t collapse on itself. Useful if there’s some wind.

Challenges: Not as much heat as some other fire structures; can take a little while to get going.

TIPI

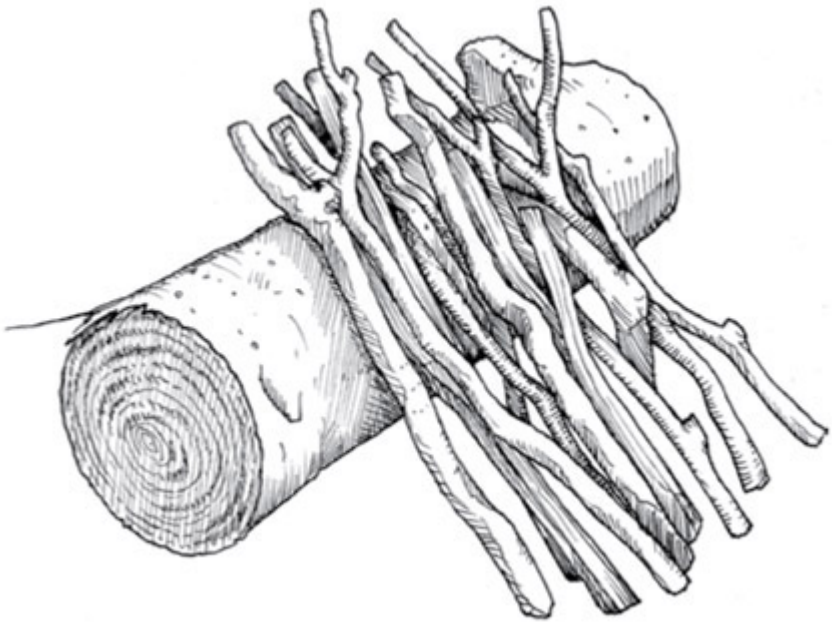
Most people I know think that the tipi fire is the best style around. It certainly has its advantages, but it can be hard for beginners to get the structure right. Often, the fire structure will collapse, and it can be hard to get it going under difficult conditions such as strong wind or rain. However, if you can get a tipi fire going, it actually provides the most heat, uses wood efficiently, and is the most useful for survival purposes.

To build your tipi structure you usually need a lot of kindling, a variety of sizes of firewood, and excellent tinder. First, build a tipi shape out of your kindling with a good-sized space underneath for the tinder bundle. Do this by balancing pieces of kindling against each other, stacking and stacking until they are firmly balanced. Be sure to leave a door in your tipi structure in order to place your tinder bundle under the kindling. Then add a layer or two of bigger kindling or even smaller firewood, carefully, without collapsing the structure. This takes practice, but once you get the hang of it and have the right materials, it becomes a lot easier.

If you are igniting your fire with matches or a lighter, place your tinder bundle inside the tipi structure before lighting and before adding any heavy pieces of wood or fuel. Then ignite your tinder bundle and start the tipi structure burning. If you are using a friction fire method and need to ignite your tinder bundle outside the structure with your coal, the tipi structure can be used very effectively. Place your coal in the tinder bundle, and as you blow it to life place it inside the tipi using the door you created. The tinder will ignite the kindling and the fire will rapidly grow, especially increasing in size upward. At this point you can carefully add more and bigger wood to the outside, trying not to collapse the tipi. If your tipi structure does collapse, usually you can salvage your fire by laying everything back on top of each other and slowly rebuilding the tipi.

Strengths: Provides the most heat and a lot of light; a great structure to build if you are using a friction fire method to get your fire started.

Challenges: Difficult for beginners, as tipi fires tend to collapse. Also can be hard to create if you don't have many different sizes of kindling and fuel ready.



LEAN-TO

A lean-to fire is another easy-to-use beginner fire structure that works just as well in rugged, wild conditions. Place one large piece of firewood in your fire pit. Then simply lay kindling pieces at an angle, with one end on

the firewood and one end touching the ground. After you've laid several pieces of kindling, your structure will look like a miniature survival shelter or one-half of a slanted roof. Place the tinder into the space underneath the kindling (the house or shelter part). Ignite the tinder and allow it to catch the kindling above it. Add more kindling and eventually bigger pieces of fuel as needed.

The big piece of firewood serves as a stable element, so this fire is hard to knock down. It also becomes a natural windblock in windy conditions. Finally, this structure can be used in a place where you can't create a fire pit; depending on conditions, you can build the lean-to structure against a rock, a log, or another natural wall.

Strengths: Easy to build; good beginner's fire. Stable, doesn't collapse easily. Works even with irregularly shaped wood.

Challenges: Doesn't produce as much heat as other fire structures and can take a while to really get going.

LOG CABIN/PYRAMID

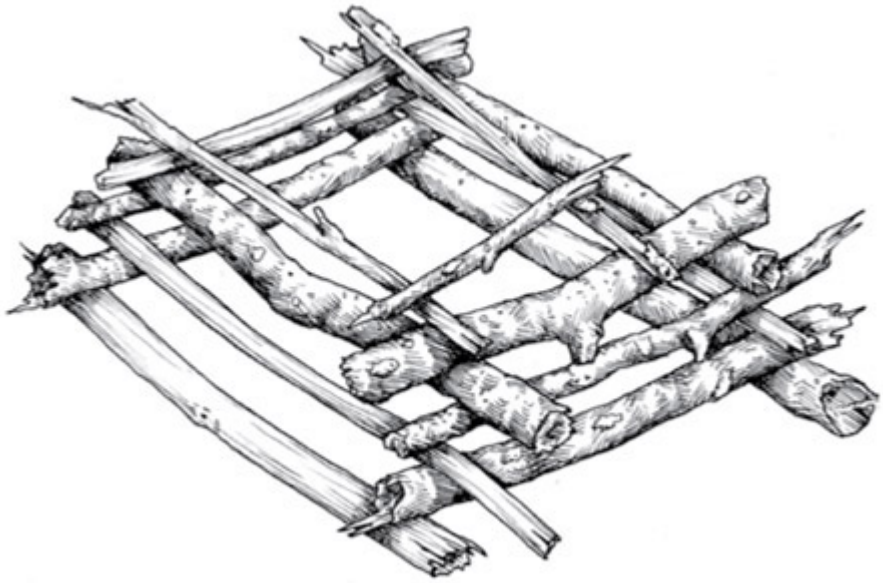
These two closely related structures are basically variations on each other, so I am including them together. This style of fire creates a lot of coals for cooking, making fire-based tools, and other projects. These structures are exactly what they sound like. To build a log cabin fire, place four equal-sized pieces of wood on the ground in a square, overlapping the pieces at the corners. This is the foundation of the log cabin. Stack medium- to small-sized firewood in this same overlapping square pattern on the foundation to build your cabin. Mix in kindling as you build or place it in the space inside the four walls. Place your tinder inside the log cabin and ignite. If you are using friction fire, blow your tinder bundle into a flame and then place it inside the structure.

The pyramid structure is made basically the same way, only you use progressively smaller and smaller lengths of wood to build a pyramid shape with a solid base and a narrow top. Be sure to put your tinder bundle inside as you build your pyramid, before you create its point. The pyramid structure is difficult to use with a friction fire tinder bundle, which you need to blow into flame and place inside, but it does work well if you can light the tinder bundle with a match or lighter through spaces in the wall of the pyramid.

Both of these fire styles produce abundant coals, lots of light, and often tall fires (the fire gets a lot of oxygen with this structure). The pyramid is more stable but harder to ignite. The log cabin tends to more readily collapse in on itself. It is easier to ignite, but it can take a little while to get the flames going.

Strengths: Pretty easy to construct. Usually big flames, good light; produces a lot of coals.

Challenges: Both styles consume a lot of wood rapidly and inefficiently.



X-FRAME

This is a unique fire structure I learned about from a former student. She had learned it in the northeast part of the United States where she often had to make fires in windy conditions. It is not widely known but extremely useful if you have to build a fire in high winds (which can be inherently dangerous and also difficult to get a flame going without it blowing out).

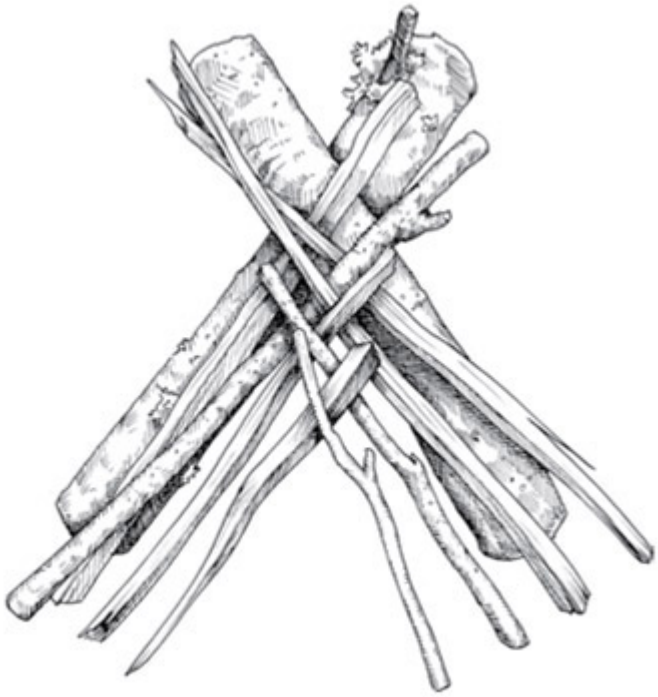
The shape is a variation on the A-frame. Instead of simply laying two big pieces of wood together to make an A, lay multiple medium-sized pieces of wood on top of each other, crossing to make an asymmetrical X-shape. The top of the X should be much smaller than the bottom. Point the littler side of the X into the wind.

After you have built your X structure, cross kindling over the wider side of your X, just like with the A-frame. Then place your tinder bundle under

the kindling, close to the center of the X. Ignite the tinder against this windbreak you have constructed. This should provide protection from the wind snuffing out your flame, and it will also provide a stable structure to prevent your fire from getting out of control. Gradually add kindling and fuel as needed.

Strengths: Great for windy conditions. Stable.

Challenges: A little tricky to build, especially for beginners; be sure to practice first in non-windy conditions. Not the easiest fire to cook on.



STAR OR 4-DIRECTION FIRE

Place three to five logs on the ground, with ends pointing away from each other like spokes radiating from a central point. Start a fire with tinder and kindling in this central space, then slowly push the cut surfaces of the firewood in toward the center of the fire.

This is a great style of fire if you have a limited supply of wood. The structure allows you to slowly and efficiently burn through your wood, gradually pushing the wood in from each direction as it burns down. It is mostly used in desert climates, where there tend to be fewer trees. The Kalahari Bushmen build their fires in this star shape.

Strengths: Burns wood slowly and efficiently. Good for climates with less wood.
Challenges: Does not produce the same kind of heat and warmth as other fires, such as the tipi fire. It also does not produce as many coals as other fire styles, like the log cabin.

UPSIDE-DOWN FIRE

This fire structure is easy and fun, and it literally turns everything about fire-making upside down. With this structure you actually build a base of firewood at the bottom of your structure. Start by crisscrossing a few pieces of medium-or small-sized firewood. Next, crisscross kindling over the top of that base, creating a good amount of burnable mass. Finally, place your tinder bundle on top and ignite it. In this case, the tinder bundle will burn, and the heat at the *bottom* of the bundle will ignite the kindling. Once the kindling is burning, it will also burn down into the firewood, slowly igniting it.

But didn't we just learn that heat rises and fire burns up? How does this actually work? This style works best with extremely dry materials that ignite easily. It also works for creating a fire in a woodstove (where the cramped space makes building other fire structures difficult). It won't work if it is raining or snowing out—the rain and snow will immediately put out the fire.
Strengths: Fun! Different and challenging. Good for use inside a woodstove.
Challenges: Requires dry materials and conditions.

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COOKING WITH FIRE

I've often found an incredible, almost indefinable, joy in cooking outside on a fire, even if it's just hotdogs and marshmallows. Several of my guy friends and I have joked over the years that we are at our most Neanderthal-like when cooking meat over a fire (or even a grill in the backyard). Fire was the one and only mode of cooking until relatively recently in human history. There are many ways to cook using fire for fun and recreation, as well as some practical tips and tricks that are useful for survival situations. In this chapter, we will examine several different forms of cooking with fire, some that are quite common and others that will open your eyes to new possibilities.

Contrary to popular belief, the best way to cook using fire is usually *not* to place food directly in the flame, which can easily result in food that is charred on the outside and raw on the inside. The actual flame of the fire is useful for cooking, but it is very fickle because it tends to flicker (those two words are obviously related). It can be difficult to control the temperature and behavior of a flame in a fire you have made yourself. However, if you wait for the flames to die down, you can use the coals to cook your food at a relatively even temperature for a long period of time, resulting in a much more even cooking process.

A good way to think about cooking with fire is to figure out what you want to cook and how. You can cook foods *directly in the flames* (think marshmallows or hotdogs on a stick) or *directly in the coals* (throwing a

potato or apple on the coals). You can cook things *indirectly over the flames* or coals by using things like a tripod, a spit, or even a flat rock as a form of stone frying pan. You can also wrap food items in noncombustibles like plant material or clay and place them directly in the fire or coals, combining direct and indirect cooking methods. Direct methods generally are for foods that don't need to be cooked a long time, while indirect methods generally are for longer, slower cooking (spit cooking is an exception to this).

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Before we get into specific cooking techniques and styles, it's important to mention again how dangerous fire can be. When you start cooking on a fire, you are heating up whatever you are cooking and whatever you are using to cook it with. It's important to use common sense and remember that anything that even goes near the fire is going to get hot, especially any metal, which conducts heat efficiently. Before you put anything into the fire or take it out, remember to use something to protect your hands. Liquids boil over easily, so keep a close eye on them. Finally, be aware that putting

things into and taking things out of fire moves the fire around, and coals, sparks, and even flames can jump out of your fire ring or pit quite easily.

Here are several different ways to cook using fire that are both fun and valuable to know:

- Cooking on a stick
- Spit cooking
- Tripod cooking
- Coal cooking
- Flat-rock cooking
- Stone oven cooking
- Dutch oven cooking

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COOKING ON A STICK

Okay, so this technique is pretty straightforward and familiar. Simply stick your food onto a long stick and hold it over the flames until it’s suitably

cooked to your taste. This is the classic hotdog and marshmallow cooking technique. However, there are a few important points to remember. First of all, choose your wood wisely, and don't use a toxic wood to cook with. You don't want anything toxic in your food.

This technique works best with foods that are precooked (like hotdogs or sausages) or foods that don't actually need to be cooked inside. This technique essentially cooks or chars food only on the outside. You can refine your stick-cooking technique a bit by cooking over the coals rather than directly in the flames. You'll be surprised at what kinds of food you can cook on a stick. Cooking apples this way can be quite fun and makes a tasty alternative to super-sugary marshmallows.

Finally, don't underestimate this technique's value for cooking certain kinds of food. In the Pacific Northwest, salmon were often cooked in a variation on this technique by staking salmon fillets and placing them near the fire (see picture). One of my fondest fire cooking memories is cooking chunks of fresh venison over a fire on sticks.

SPIT COOKING

This is the classic movie or even cartoon technique of cooking over a fire. In the classic scene, a character slowly turns a chicken on a stick spit over the fire. It's sort of like old-school rotisserie. This technique is actually harder than it looks, and it can take a long time, especially, for example, if you are cooking a whole chicken over a fire.

To execute this technique properly you should have a good fire pit and a fire that has already burned down to coals. You will need at least three sticks to assemble your spit. They should be somewhat thick (thin sticks can break and spill your food into the fire). Place two Y-shaped sticks on either side of the fire. They should be sunk into the ground at least 4 to 6 inches. You can sharpen the bottom end to make this easier. The central stick will go through the center of whatever you're cooking (most likely meat). Carefully balance the central stick with the food on it between the two Y-shaped sticks. Once the spit is set, you can build up your fire a bit if you need to, or cook directly over coals if they are warm enough. Slowly rotate your food over the coals by turning the central stick.

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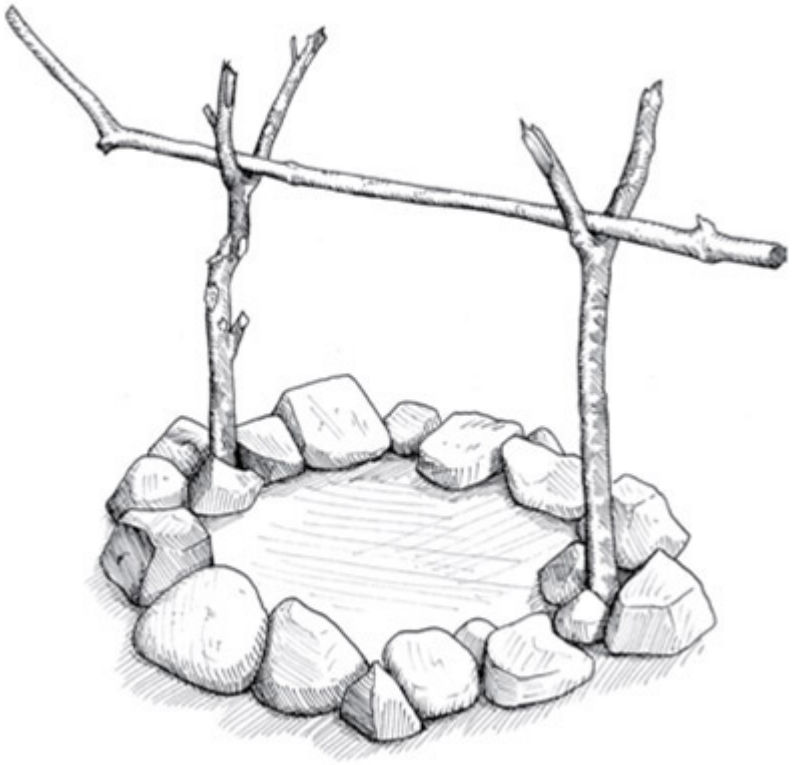
The biggest challenge with this method is cooking your food all the way through. It works well for small game and birds, and animals like rabbits. Bigger than that and it’s best to cut your meat into chunks and roast them on the spit over the fire like a shish kebab.



TRIPOD COOKING

This is another classic storybook style of cooking that is a little trickier than it looks. When used properly it can make great stews, soups, or teas.

To use this style, you need three pieces of relatively long (around 3 feet) and solid pieces of wood, a little thinner than your forearm. Place the three against each other to form a three-pronged tipi. Lash the pieces of the tripod together to create a solid interface. This can be done by wrapping each piece of wood several times, then wrapping the cords in between the pieces several times.

Similar to the spit fire, the tripod should be put in place after you have already created a fire and let it burn down (otherwise you are in danger of lighting your tripod on fire). Once you have a solid fire pit with good coals, you can place your tripod around the outside of the pit or fire ring with the center of the tripod's triangle tips over the center of the flame.

From this central point, you can hang a kettle, a pot, or a teapot (or even a witch's cauldron!) over the fire. Pour in water to heat or boil, make tea, or even start making a stew. Build up the fire and flames underneath the tripod as needed to cook your meal. This is a great way to boil things, and it can

be used to purify water for drinking. If you are cooking a wild soup, bring the water to a slight boil but then knock down the flames or spread out the coals so your soup doesn't boil over.

COAL COOKING

While pretty much all the methods mentioned here can or do use coals to cook, proper coal cooking is putting food directly into the coals to cook it. This may be one of the earliest ways of cooking, and may even be how our ancestors decided to start using fire to cook (it's speculated that our ancestors ate charred starchy vegetables that had cooked in the coals of forest fires). It is a great method for cooking things for a long time, especially starchy roots like potatoes, or wild foods like cattail roots.

One way to cook on coals is to simply chuck your food on the coals and turn them over relatively frequently. This will char the outside and sort of cook the inside. This may sound less than desirable, but it works pretty well with foods that have natural skins such as potatoes or apples. However, wrappings can refine this technique quite a bit.

If you are camping, you can simply wrap your food in foil and throw it into the fire. A classic camping cooking meal is to cut up veggies, meat, and cheese and fold them up into an envelope of aluminum foil and place it on the fire. This is sometimes called a hobo meal or hobo cooking. It produces evenly cooked food that is delicious.

If you want to do a wild version of this, you can wrap your food in big leaves such as banana leaves, ferns, grape leaves, or similar nonpoisonous plants. This technique is used quite a bit around the world, especially in tropical areas. The leaves prevent the food from charring and let the food inside cook thoroughly.

Clay can be used to cook fish or chunks of small game in the coals. Simply cover the meat with wet clay and place directly on the coals. Turn the clay-coated meat often to cook all sides. The clay will bake onto the outside of the fish or meat. When you are ready to eat, break the outside of the clay and scrape out the quite delicious clay-cooked fish or meat.

FLAT-ROCK COOKING

A flat, thin rock becomes your own wild frying pan with this fun cooking method. Look for a rock that is at least 6 inches across and 6 inches long.

Make sure you clean your rock thoroughly of sand, dirt, mud, or other debris.

Carefully balance the flat rock along the inside edges of your fire pit. This allows the rock to be warmed by flames and coals without immersing it directly in the fire. The stone takes a while to heat up, but then retains its heat for some time. Splash a few drops of water onto the rock to see if it's ready. The rock is ready when the droplets hiss and immediately turn to steam.

Once the rock is this hot, it works just like a frying pan. You can cook pancakes, eggs, fish, other thinly sliced meat, and even vegetables.

A variation on the flat-rock method works well for longer periods of cooking. You can build a flat-rock fire pan on top of other rocks and place coals underneath. This style works best in a bigger fire pit. Make your fire small enough that you can build your frying pan station inside the fire pit itself. This time the frying rock/pan will heat up by being near the fire and coals, but you can also scoot coals underneath it. This produces heat quicker and for longer periods of time. You just need to have a fire that has a lot of coals to make it work. Overall, this is a useful, novel, and easy way to cook food on a fire.

SMOKING MEAT AND BARBECUE

The word "barbecue" is now synonymous with grilled, smoked, or fire-cooked meat. The word originated in the Caribbean and the southeastern United States, referring to meat cooked for a long time at low temperature over a smoky fire. The earliest word for barbecue was probably the word *barabicu*, which was an Arawak word from tribal people in the Caribbean (and also used by the Timucua tribe of Florida). The word was adapted into Spanish as *barbacoa*, and eventually into English as barbecue.

It's impossible to know for how long people have been using fire and smoke as a form of cooking and preserving meat, but it is important to point out that smoking meat over a low temperature

greatly increases the ability to preserve the meat and prevent spoilage. In most of the world, some form of smoking meat exists and is still used even to this day, even if just for the flavor.

STONE OVEN COOKING

Stone oven cooking is the next step up from flat-rock cooking. In this cooking technique, you build a stone oven with rocks in or near your fire pit. There are some fancy ways of doing this, including using clay to construct a combination stone and clay oven. Those ways of building an oven are awesome, but they do take some time and practice and are beyond the scope of this book (however, for reference they are probably how we got things like tandoori ovens and the style of oven used to cook wood-fired pizza).

A more basic version is to literally build an oven out of rocks. It helps to have multiple flat, thin rocks for this, but you can make it work with other kinds of rocks. *It's important for this style of cooking to use rocks that are from a dry location. If the rocks have been immersed in water or are from a damp and wet environment, they can crack or even explode when heated to extremely high heats*. To build your stone oven, you build the same structure as for your flat-rock frying pan: a flat rock balanced on top of other rocks. However, this time you will also build *around* your flat frying pan surface,

building an arch of other stones around your flat-rock base. You also cover the back, and in essence you have a miniature oven made out of stone with an open face.

Once you have this oven structure, build a small fire inside, heating up all the rocks around your frying pan surface. You can leave the coals in the oven and brush them toward the back of the oven to free up your cooking surface. When there is sufficient heat, you can bake in your stone oven—bread, pizza, biscuits, sliced-up root vegetables, and even different kinds of meat. To make the oven more efficient you can close the open face with another rock after the food has been placed inside.

If you have extra coals or have another fire nearby, you can place coals underneath the oven as well to keep the heat going for a while. While this style of cooking takes some time to create as well as time to bring up to a cooking temperature, you also end up with a permanent or semi-permanent structure for cooking in the future.

DUTCH OVEN COOKING

Despite our history of cooking primarily on fire for most of human history, it sometimes surprises people what they can actually cook on a fire. This was certainly the case for me when I was 20 years old and I encountered Dutch oven cooking for the first time. I was an apprentice wilderness guide at the time, and was I surprised when on a river rafting trip I was assisting with, the lead guides cooked an amazing blueberry cobbler in a Dutch oven right on the fire.

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Dutch ovens are one type of the broad category of cast-iron cookware. Cast iron is incredibly durable, ideal for cooking on fire, and also incredibly heavy to carry (great for boat trips but not so much for backpacking!). A Dutch oven is a deep, wide pot with a sturdy lid and a tripod of legs that allow you to cook directly in or near a fire. As with most kinds of fire cooking, it actually works best if you use coals to do the actual cooking.

I recommend putting your Dutch oven near your fire while you're placing your ingredients in it. This requires some caution, but it also starts to heat the pot before you actually cook (kind of like preheating your oven at home). You can cook stews, casseroles, cobblers, crisps, and almost anything else you would cook in a conventional oven in a Dutch oven. You simply place all the ingredients in the Dutch oven, move it near the fire or directly into the coals, and then, if you have enough coals, use tongs and carefully place some coals on the lid as well. Just like the above methods, it can take a while for your Dutch oven to warm up, but once it does it retains heat for quite a while and cooks food thoroughly. You can check the food at

different times by carefully lifting the lid, but realize that this releases built-up and trapped heat.

When your food is cooked and ready to be served, it's relatively easy to use a leather glove, pot holder, or other insulated device to lift the Dutch oven out of the fire pit by its sturdy metal handle (one of the things it's designed for) and serve the warm cooked food directly out of the pot.

Once you are done cooking, be careful about cleaning your Dutch oven. Cast iron requires special care. You can't use soap and water to clean it, only water. And it needs to be oiled after use to prevent rust. It also may need to be seasoned in a particular way before being used. If cared for consistently and with awareness, cast-iron cookware can last a lifetime and even be passed down through generations.

With a little ingenuity, some basic fire skills, and a bit of the right equipment, you can cook almost anything on a fire outside. The instructions given here are all important, but they're just the logistics. It's impossible to express on paper the fun, enjoyment, and satisfaction that most people get cooking on a fire. It's a great family activity. It's fun for team-building, and it's a gratifying solo survival challenge. The act of preparing food on a fire also awakens something deep and ancient in us. It's almost as if we remember those ancestral times when we *had* to cook on a fire. We recognize that cooking food on a fire meant a successful hunt and a good meal to share.

PRO TIPS

To this point we've looked at the obvious ways to work with and make fire. We've built the foundation and planted the roots of a relationship with fire. Over time you may realize that fire can be used for a variety of other purposes, and there are a lot of great shortcuts and professional hacks that will allow you to turn fire into an ally. The miscellany of this chapter covers several key tips to take your fire skills to the next level. Many of the tips shared here are also the insider keys that survival-skills instructors around the world use as part of their path to mastery of fire.

PITCH OR SAP

One of the most amazing things about wood is that most kinds can actually burn. Often we don't ask or explore why. Most wood is a form of stored sunlight, which when dried out sufficiently can be ignited to produce a flame. But that's just one piece of the puzzle. Sap is a fluid that flows throughout trees, carrying nutrients up and down the trunk and to the extremities of both the branches and the roots. The sap of many trees, especially conifers (cone-bearing trees commonly known as evergreens), is actually very flammable. In fact, some forms of sap are chemically similar to fossil fuels. If harvested correctly, they make amazing fire starters and enhancers. In North America, many pine family species and evergreens have flammable sap and pitch, including hemlock, fir, pine, and spruce. In

addition, birch trees have flammable pitch and resin, as do mesquite trees in the Southwest. In fact, some trees have so much sap or pitch that it makes them poor firewood because they produce so much smoke and are slightly toxic (more on this later in the firewood section).

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Sap functions inside a tree similar to how blood behaves in the human body. In fact, if a tree gets a wound, such as a broken branch or gashed bark, sap will flow to the area to heal and repair it. Once the sap is exposed to air, it will typically harden over time. This semi-hard material on the outside of the tree is referred to as pitch. You can harvest huge chunks of pitch and carry them as part of your methods of ignition. Adding pitch to your kindling will greatly enhance your fire-starting chances. I recommend harvesting pitch in the cold winter months, as it is harder during that time. As temperatures heat up, the pitch will get softer and even liquefy on hot summer days.

Pitch or sap is super helpful for getting a fire in rainy conditions. It ignites and stays lit even if the environment is soggy. It can help ignite wet

kindling and tinder in even the most challenging conditions.

In addition to being a great fire-starting aid, many forms of pitch have strong medicinal properties for treating wounds, and helping with aches and pains and even respiratory problems. The most famous medicinal substances in the world, frankincense and myrrh (two of the three treasures carried by the wise men of the Bible), are actually pitch from specific trees.

FATWOOD OR SAPWOOD

While finding pitch or harvesting sap from inside a tree yields great results, every once in a while you can get lucky and find what's called fatwood or sapwood. That's a piece of wood with a higher-than-normal concentration of sap, and it makes an excellent fire starter.

Under the right conditions, sap collects and settles in large amounts in one part of a tree. Douglas fir, hemlock, other firs, spruces, and some pines all have forms of sapwood or fatwood. In some trees this happens after the tree dies. In fact, in both sandalwood species and the tree known as *palo santo*, the sap concentrates after the death of the tree to produce incredibly fragrant incense wood. The longer you wait after the death of the tree, the more potent the incense.

The high concentrations of sap inside the downed tree make for very flammable and easy-to-ignite tinder and kindling. I've seen people throw a spark with flint and steel into a pile of sapwood that had been shaved into sawdust. The spark ignited the pile immediately, and it stayed burning like a candle. You can also carve off a small sliver of sapwood, ignite it, and then use it as a natural, long-lasting match, or use a few shaved pieces of sapwood as a form of super kindling.

Sapwood or fatwood is a great find, and I recommend harvesting it carefully and using it in small amounts over time.

MAKING YOUR OWN FIRE STARTER

Finding and using natural materials is a great skill and can be a lot of fun. However, I also recommend carrying some kind of emergency fire starter. This is a specific tool that can be bought or made, not just ignition and some tinder in your pocket. A fire starter can serve as both your tinder and kindling in an emergency. True emergency fire starters can simply be lit with a match or lighter and will burn unaided for several minutes while you

add kindling and fuel. There are commercial fire starters available that are excellent to carry with your essential survival gear in a daypack or backpack. These are usually made from compressed wax and sawdust, though there are other products of different combinations on the market, too.

To make a fire starter at home, coat a cotton ball with cooking oil or petroleum jelly. I prefer the petroleum jelly as it's a little less messy. Dryer lint makes excellent tinder and can also make an excellent fire starter. Mix a handful of lint with a tablespoon of petroleum jelly, or cover with hot candle wax and cool to harden.

BURNING DUNG

Through most of this book, when we've been talking about making fire we've been talking about using wood as a fuel source. In many places, this is the most readily available and useful fuel. Modern technologies have added all sorts of other ways to create and maintain flames including chemical charcoals, natural gas, and compressed sawdust. However, there is another ancient technique that can be useful, especially in landscapes short on trees and wood.

The burning of dried animal dung happens around the world. Dried dung from an herbivore can make incredible fuel. Often it can be ignited directly with a flame (without tinder or kindling needed), and it can burn at a good temperature for a long time. While this may seem strange to our modern sensibilities, dried herbivore dung actually functions like a form of natural charcoal. As long as it is dried out, it has no smell. Some of the animals that produce good dung for fire include bison, elephants, camels, and horses. In the desert, dung may be the only source of fuel available for fire.

Several of these can be stored and carried in a watertight plastic bag, watertight container, or tin (Altoids tins work well). When the time comes,

take out one or two starters, light them with a match or lighter, and then build the rest of your fire around them.

The lint-wax method should produce a bit longer-burning and slightly smaller flame than the cotton ball method, but experiment and see what works best for you.

FUZZ OR FEATHER STICKS

It can be challenging to get a fire going in rain, snow, or otherwise damp conditions. Wet kindling, tinder, and fuel are difficult to light and easily extinguished. Fuzz sticks are a kind of super kindling that can help in these conditions.

To make a feather or fuzz stick, partially carve several slivers of wood into kindling-sized wood. Don’t actually carve off the shavings, but leave them attached to produce a stick that looks like it’s covered in fuzz or feathers. This increases burnable surface area, allows for greater air circulation, and exposes the dry inside of the wood. Add these pieces along

with kindling. The fuzz sticks will burn and help ignite bigger pieces of wood.

FIRE TONGS

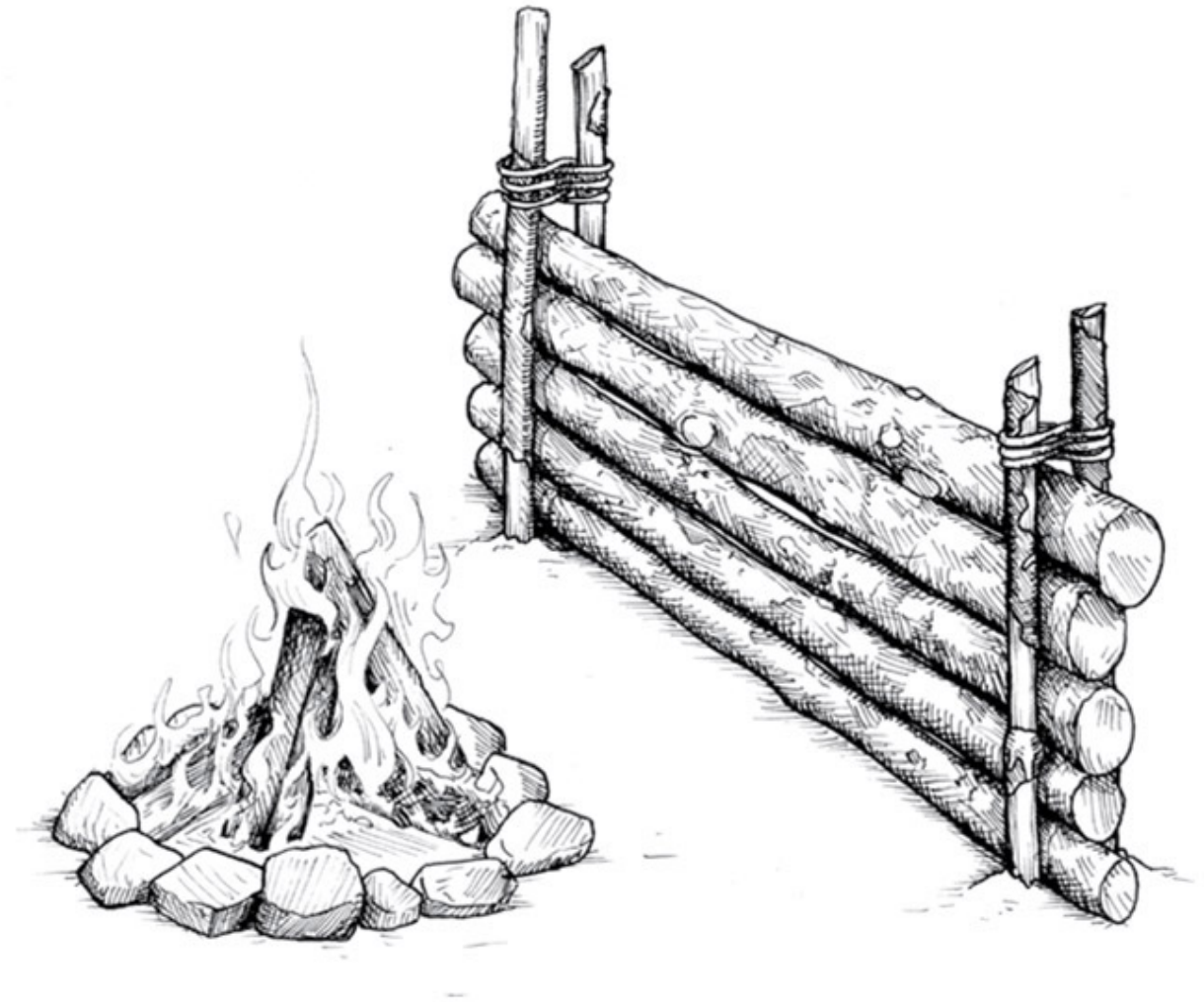
It can be difficult to safely tend a roaring fire without exposing your skin, clothes, and body to smoke and flame. A big fire might be necessary for warmth, coals, or utility, but it can also be dangerous. Enter the fire tongs. Fire tongs are simply two long sticks about 3 feet in length that are at least an inch or two thick (you can lash them together if you want, but I find it easier to work with them separately). These two tongs can be used to move pieces of wood around inside the fire without getting your hands or body close to the flames. You can add wood, move wood and coals around, and so forth all while staying safe and relatively smoke free. It's best to make your fire tongs out of green wood (wood that is not old or aged) or a hard wood that doesn't ignite easily. After using your tongs for a bit, the ends may start to char or even catch on fire, which is fine. Simply extinguish them by rubbing them against the earth or some stones until they are no longer smoldering. A good pair of fire tongs will last through many fires before needing to be replaced.

FIRE REFLECTOR

Once you have a fire going, there are all sorts of things you can do with it: cooking, making things, or simply enjoying the heat, light, and cheeriness that fire naturally brings. However, if you are using your fire as your sole source of heat on an overnight adventure or in a survival situation, building a fire reflector can help out in a big way. Often, people are quite amazed at how much warmer they feel when using a fire reflector of some sort to enhance their fire.

It's usually best to build your reflector *before* you build your fire. A reflector is simply a wall of something built on one side of the fire pit that will help reflect a huge amount of warmth and heat that otherwise tends to naturally dissipate out the other side from where you are sitting. You can build a fire reflector out of natural materials; a wall of green logs, secured in place by big stakes sunk in the ground, makes a great reflector. You can also build your fire near a large rock or rocks that will naturally reflect heat at you. This is an ideal option because over time the rocks will absorb a lot

of heat and will start to radiate that heat toward you as well. Many fires built in or near caves use this principle naturally. You can also build a reflector out of many smaller rocks or stones if no large ones are nearby. I once saw a bomber fire reflector built out of a series of flat stones that made a long, tall fire reflector wall.



Your reflector doesn’t necessarily have to be built out of natural materials either. If you carry a heat-reflecting emergency blanket with you as part of your survival gear, you can use it to make an amazing fire reflector as well. Before you make your fire, simply tie some cordage parallel to where you will be facing, away from the fire and across from where you will be sitting. Then attach your reflective blanket to the hanging rope (you can use duct tape, more cordage, or other creative methods). If you don’t have anything to attach the blanket to the rope, you can “double

over” the blanket by folding it in half with the rope in the middle crease of the fold. It’s helpful to secure your blanket to the ground by placing stones on it. This prevents the blanket from flapping around and getting into the flames, and creates a more stable, solid reflector.

FIREWOOD

The nuances of firewood could fill an entire book. The big question is, What makes good firewood? Honestly, it depends. There isn’t one simple answer, but here are some helpful hints I want to share.

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Chapter 8 will detail specific firewood species by each bioregion, but let’s start with the general principles. It took me a while to learn what burns well in my woodstove, which is different from the best wood for making a fire under survival conditions in the lush, wet Cascadian forests where I

live. In some sense, the best firewood is what you have. When you have a choice, though, firewood selection gets complicated.

First of all, dead wood burns best. Breaking green branches off a live tree or cutting down a tree are both terrible choices for firewood. Firewood that has been sitting on the ground for too long also tends to be damp and will produce a lot of smoke. If you are harvesting wood in the wild in a survival situation, try to find dead, dry wood that is still attached to a tree. Hemlock and cedar trees tend to produce this wood due to the way they grow.

Most wood needs to be aged for quite a while once chopped before it makes good firewood. Aging needs vary by bioregion. In a desert environment, it takes six months to a year for chopped wood to age into choice seasoned firewood. In a wetter climate, wood needs to be seasoned for at least a year and sometimes even two before it is ready to burn.

How do you season and dry wood? It's best to stack it up off the ground after it has been cut and split. Stacking it on wooden pallets or a surface with at least 6 inches of dead air space below helps keep it from molding. Ideally your woodshed or woodpile faces south so that it gets maximum sun and light exposure. Many people like to split and cut their wood when it's green or semi-green because it is softer and easier to split. A lot of wood gets harder to split over time. This isn't always the case and again may vary from species to species.

What species of wood should you try to burn? Again, the answer varies from region to region, but there are some general guidelines. Wood can generally be classified as softwoods or hardwoods. Softwoods are typically conifers or cone-and needle-bearing trees. Examples include pine and cedar. Their wood tends to be softer and more resinous, and it burns a lot faster than hardwoods. Hardwoods tend to be deciduous or leaf-bearing trees that lose their leaves in the fall. Hardwoods indeed are a lot harder and tend to burn longer and hotter. Classic hardwoods include oak and madrone. Some hardwoods such as madrone and osage burn so hot that the warranty on your woodstove is void if you burn them in it. (They burn so hot that the normal fire protections on your woodstove don't work anymore.)

While the above guidelines are a good way to get started, it's important to practice and gain your own practical knowledge. You also can ask around and check in with local resources near you. People living in rural areas

often have much practical knowledge about these things, and you never know what you might learn.

Where I live, there are a lot of practical considerations. For instance, many people love to burn Douglas fir as firewood because it burns hot and ignites pretty easily. It's also prolific and fairly easy to obtain. It seasons well and doesn't tend to get moldy. However, it does burn quickly, and you can burn through a lot of it fast. Alder is often considered a difficult wood to work with, but if you can get a fire going in your woodstove or fireplace with another kind of kindling (like cedar or hemlock) then add alder, it will burn slowly and warmly, producing a good amount of heat for hours and hours (sometimes all night!).

This kind of knowledge takes time to learn, but I've tried to collect some of the shared wisdom about this and other fire-starting topics in the next chapter. We will be taking a tour of all the major bioregions of the United States and looking at the best woods to harvest for kindling, tinder, firewood, and fire-making.

FIRE ON SNOW

When it's cold, icy, and snowy out, there's nothing like being able to get a fire going to lift spirits and feel more comfortable and confident in your outdoor skills. It can be challenging to pull this off, but the trick is to look above and below. First, make sure you aren't making a fire right under a snow-covered tree. As the fire heats up it will melt that snow, which will dump right onto the fire, putting it out! So choose your site wisely.

Once you're clear on what's overhead, turn your attention to what's underneath your fire site. The ambient temperature of snowy ground is quite low. The cold ground sucks heat away and makes it difficult to get a fire going. Once lit, though, the fire will melt snow and ice, producing water. If your fire is directly on the ground, that water is likely to put your fire out or at least make it a big, steamy mess.

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The remedy is actually quite simple. Build a platform of fuel-sized wood (it can also be smaller sticks if that's all you have available), and then build your fire on top of the platform. This will keep your fire off the icy or snowy ground and prevent issues with melting. Even if the platform is made of wood that is not perfectly dry, it will still function. In fact, greener wood may work better in this situation because it will burn much slower and longer, providing a platform for your fire for a longer period of time.

CHARCOAL, ASH, AND BIOCHAR

After your fire is out, there are interesting bits and pieces left over that can be put to use. For instance, the leftover white or gray powdery parts are ash. You need to be careful with ash because when mixed with water it creates lye, a caustic substance that can damage your skin. Lye is dangerous, but it has its uses including tanning animal hides. Ash is also basic on the pH scale, and adding it to your garden or yard may be helpful.

Charcoal is another useful by-product. You can use it to draw or write on things. You can crush it and mix it with water to make a basic black paint. It can also be mixed with pitch or sap to make an incredibly useful natural glue known as pitch-glue.

The deliberate extinguishing of wood by smothering it while it is on fire creates various useful varieties of charcoal. These charcoals then can be reignited with relative ease and will tend to burn at a specific temperature for a long period of time. In fact, in ancient times making charcoal was an art, and being able to produce charcoal that burned at different temperatures for different uses was a desirable and highly refined skill.

A friend of mine recently returned from South Sudan where he saw the creation of charcoal as an everyday activity for local people. Locals there make charcoal to burn wood more efficiently and produce more energy per weight than just wood itself. To create charcoal, locals build a large, long mound of wood then bury it in earth. They light one end of the wood through a small hole, then let the whole thing burn and smolder for hours. Anywhere that smoke, light, or fire leaks through is immediately covered with more dirt. After many hours, this process creates massive amounts of charcoal that can be used by the village.

In addition to ash and charcoal, controlled burns and ancient agricultural techniques also create a unique product called biochar. Biochar is a way of deliberately returning and restoring nutrients to the soil and sequestering carbon. Biochar is experiencing a revival in interest by landscape designers, permaculture practitioners, and those exploring different organic growing methods. There seems to be considerable evidence that biochar was part of an ancient process that produced incredible growing results in the Amazonian rain forest.

As we wrap up this section of the book, I want to leave you with an incredible story about the power of fire, intention, and rising to the challenge of the moment. This comes from fellow teacher, storyteller, and friend Natalie Rivera-Booth. All too often stories of fire, survival, and the outdoors focus on rugged men triumphing over challenging conditions.

Natalie’s story paints a different picture, showing us a different form of triumph.

FIRE AND INTENTION

The children were cold. Teeth chattering cold. Numb, stiff fingers and whiny voices cold.

“We’ve got to get these kids warmed up, quick. Natalie?”

I was waist deep in soaking wet sword ferns. It was wet everywhere: me, the kids, the plants, and the trees.

An acquaintance of mine had asked me to take over her small outdoor program for kids. She needed to head in a different direction in her life, and I was to be her replacement. On that particular day, I was there to follow her class, observe her style, and meet the kids.

The Pacific Northwest blanket of winter water had come for us, the long arms of ancient western red cedars and Douglas firs offering us all wet, loving hugs. This overwhelming affection was more than our bodies were equipped to handle.

Tiny shivering children with big eyes were scattered around me, bewildered by the wet and by the cold creeping toward their bones.

“Natalie? Can you do it? We need to get these kids warm. Make a fire. Please!”

My body heated up at this request, and my heart chilled with panic. I know how to make fire from friction, but doing it was another story. I had been a student at wilderness survival schools for two years. Making fire from friction was a core part of the curriculum. During my first lesson I had the luck to get a coal. This was celebrated by the staff and my classmates: I was in the club. Did that encourage me to practice? Nope. I sat on my laurels, too afraid to fail or be challenged by the art of the fire-making. So my ego carried around my fireboard, spindle, bow, handhold, and tinder bundle in my backpack, a badge of honor that I didn’t deserve.

I had cleverly avoided situations where I would be the one to make a coal for the fire. Now I was being called upon to use the skills I was pretending to have to keep the children safe, and I couldn't keep them safe. Oh regret, regret, regret, what a teacher.

The voice of another one of my teachers came to me. "Rubbing two pieces of wood together to get a fire is impossible," he said. "It takes a miracle, so ask for a miracle before beginning to rub two sticks together."

Today is the day I needed a miracle in service to these children.

In the skirts of the nearest grandmother cedar tree, I put my cedar fire kit against my heart and made a prayer, asking for help making a fire to keep the children safe and warm. "Please, please, please, help me help these children!"

I called the children over. They came with arms full of gathered twigs and stick for fire wood. I set up my kit and tinder bundle.

"Okay everyone, are you all ready for a fire?"

"Yes!" they shouted

"While I am making a fire, I need your help. Focus on my kit, imagine the fire being born and all of us toasty around its dancing flames. Got it?"

They were stoked! Immediately they started.

I laid the board on a dry spot on the earth.

The children were cheering, whooping, and hollering.

I strung my spindle in the bow.

Children started chanting, "Fi-Yur! Fi-Yur! Fi-Yur!"

I put the spindle in the notch and my body in position.

One child sang, "Fire light come to me, fire light you're a friend to me, thank you for your light!" Another child with her eyes closed on her knees prayed, "Please god, please god, give us fire."

I was praying to have the physical strength to keep up with the necessary exertion of constant downward pressure with my left hand while constantly moving the bow back and forth with my right. I expected to have to do this for dozens and dozens of times.

In-breath, let's see what happens.

One stroke

Two strokes

Three strokes

The beautifully woven threads of cedar smoke curled up, touching our faces, such a sweet scent.

Four strokes.

The fine, precious black dust surrounding the tiny, glowing miracle. It was absolutely and without a doubt a coal.

A COAL IN FOUR STROKES!

The children exploded with delight and triumph. I sat there completely stunned.

We all blew gently in turn onto the tinder bundle and transferred it to the tiny stick structure built by their instructor.

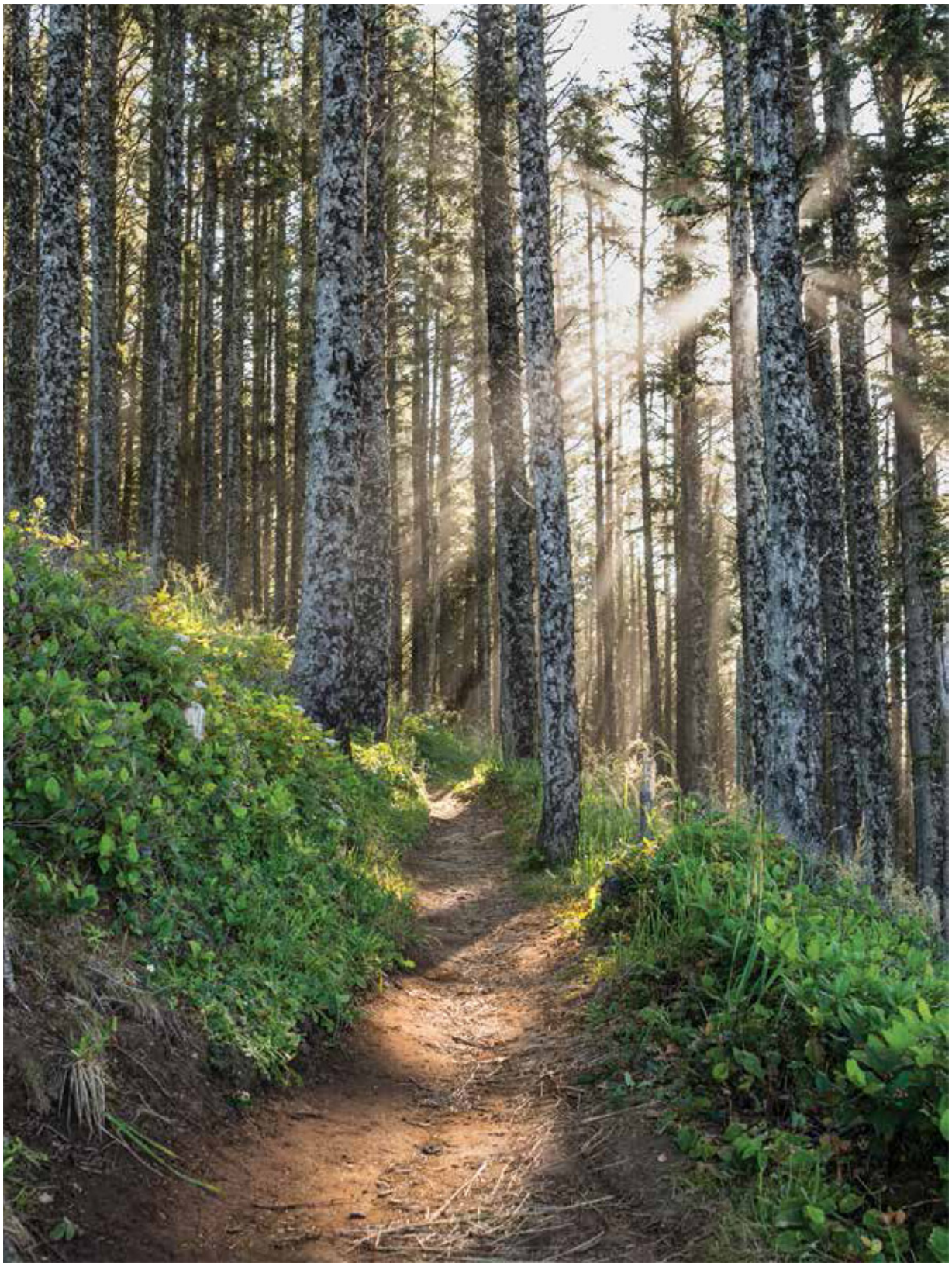
Soon we had the dancing flames keeping us all toasty that we had imagined minutes before.

“Wow, you’re really good at fire. I’m glad I asked you to bring your kit today,” the instructor said to me, as if this was all totally normal for me.

“Yeah, I didn’t do that. Honestly, I don’t know what happened, that was crazy.”

It has been eleven years, and I still do not know what happened that day.

—Natalie Rivera-Booth



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SPECIES

Many stories are told of the amazing survival feats and skills of the last indigenous full hunter-gatherers in North America. These include tales I've heard of an Apache teacher named Grandfather. The stories about Grandfather are numerous and varied, but one of the most amazing things attributed to him is that he spent a considerable amount of time wandering all over North America (and possibly even South America) living off a variety of lands and ecosystems while learning and sharing survival skills. Even though Grandfather grew up in the desert among his Apache elders, teachers, and family, he was able to apply what he learned there to any environment he traveled to. For instance, he could adapt his fire- and shelter-making skills to much colder, more northern conditions because he understood the underlying principles of survival.

Most of my survival-skills training and development has been in the moist, dark, verdant forests of the Pacific Northwest. However, I have traveled around the country and the world, and I have been surprised how much of what I learned has been transportable to completely different bioregions. When I lived in Arizona, I was quickly able to pick up making fire, finding water, and making suitable local shelters (very different in the hot desert than in the rainy Northwest!). I've enjoyed traveling to other areas and practicing fire-making in places like California, the Rocky Mountains, Texas, Hawaii, and the Desert Southwest. It is pretty amazing to find similar species in vastly different bioregions that help you make a fire.

This next section of the book has a few purposes, and to make sure it is helpful, accurate, and useful I've turned to my extended network of survival-skills teachers, schools, and alumni to create a comprehensive list of useful species of trees, shrubs, and plants. The goal of this section is to provide you with a solid list of useful species for your bioregion. This can be a starting point for your journey with making fire. However, in the spirit of Grandfather's wanders and journeys, I also hope that this list makes this book an extremely useful resource *for when you travel elsewhere in the United States* (and perhaps even the world). May it serve you well on your learning journey and help you in your relationship with fire!

TREE, SHRUBS, AND WOOD

Before we jump into this next section, it's important to mention a few important botanical details. Plants all over the world play a huge role in the lives of all animals including humans. The development of flowering plants was instrumental in allowing life to flourish throughout the planet. For a long time, the main life cycle for many plants in cold regions was to literally die during the winter months and regrow from new seeds or from existing roots. However, over time certain plants developed an adaptation to harden their outer stems and even to develop a hard, thick outer skin around a central core. We call these adaptations "wood" and "bark," and they are part of what distinguishes trees and shrubs from other herbaceous plants. Wood inherently stores more energy than comparable soft, green structures, and this energy helps create fire and release heat while burning. This doesn't mean that other plants aren't useful for making fire. On the contrary, they can be extremely effective, especially in the form of tinder. However, this section will focus on trees and shrubs because of their woody adaptation and the role it plays in making fire.

PACIFIC NORTHWEST/CASCADIA BIOREGION

WASHINGTON, OREGON, AND NORTHERN CALIFORNIA

The Pacific Northwest is characterized by a lush, cool, and moist climate populated with large numbers of trees and large forests. It has the densest areas of biomass in the world (even greater than the Amazon), and includes large parts of Washington, Oregon, and northern California.

WESTERN RED CEDAR

Thuja plicata

Where found: Moist forests, often near water

Description: Medium- to large-sized conifer with scaly needles, small cones, and very fibrous, reddish outer bark. The droopy branches, distinctive color, and style of bark make western red cedar easy to identify.

Uses: Western red cedar may be the most important tree for fire-making in the Pacific Northwest. The fibrous bark can be peeled away from dead trees or carefully cut from live trees. Then the inner bark can be scraped to make a dry, fluffy, and very effective tinder bundle (even if harvested when wet). This inner bark is some of the best tinder around. Wood from the trees splits easily and can be shaped into a variety of tools, objects, and pieces. A whole bow-drill kit can be made from western red cedar, and it can serve as the fireboard or hearth for hand-drill. The wood can also be split into effective kindling, though it doesn't make good core fuel wood for bigger fires as it burns too quickly and sparks quite a bit. Like most conifers, western red cedar also produces a highly flammable pitch that is aromatic and helpful in getting fires going in wet conditions.

Naturalist note: Similar to western or eastern hemlock, the dry, dead branches of western red cedar can be harvested directly from the tree. These small twigs stay dry by not touching the ground and being shielded from rain by the upper branches that are full of needles. The twigs may need to be split lengthwise to expose the dry, flammable inside.

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WESTERN HEMLOCK

Tsuga heterophylla

Where found: Moist forests, often near water

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Description: Western hemlock is a common coniferous tree in the wet forests of the Cascadia bioregion. It is found in healthy, shady forests and does not tolerate lots of sun very well. It has small cones and small, flat green needles (similar to fir trees) that stick out in different directions from the branches (though the needles are not actually whorled around the whole branch). The needles are a much lighter, almost white, color underneath and have a distinct line down their middle. Western hemlock trees can be identified from far away by the fact that the tip-top of the trunk is extremely

thin and droops. This is called a “drooping apex” and allows you to spot a hemlock tree from hundreds of yards away. Its cousin, the eastern hemlock, is virtually identical in appearance and uses.

Uses: Western hemlock is far too hard and full of pitch to make it useful for friction fire, but it has other characteristics that make it extremely useful for fire-making. Hemlock branches grow in such a way that the upper branches shade out and kill the lower branches. The lower branches stay attached to the tree even after dying and turn into almost perfect dry, hanging kindling. In mature trees, you can gather a large amount of kindling and even micro-kindling, which allows you to get a fire rapidly under almost any conditions. It is also usually easy to find dried, flammable pitch on the tree, which can be mixed with the tiny, thin branches to get a blaze going.

Naturalist note: The dry places underneath the mature branches of hemlock trees where the dead branches are found also make a protected shelter. Even on the ground after months of rain, the dead branches can be dry to the touch.

Important note: *Western hemlock and eastern hemlock are both coniferous trees. They are completely different species from the herbaceous plants water hemlock and poison hemlock, which are quite toxic to humans and potentially lethal. Socrates made these lethal, poisonous herbaceous plants famous by committing suicide by drinking an extract of hemlock (but not from the trees!).*

BIGLEAF MAPLE

Acer macrophyllum

Where found: Sunny, open forest edges

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Description: Bigleaf maple is an incredibly distinctive deciduous tree. Its seasonal leaves are massive versions of the typical maple leaf shape. They can literally be bigger than a human head or as big across as two human hands. Not all the leaves are that big, but the vibrant, iridescent green leaves are much bigger than typical maple leaves. The trunks have deep-furrowed bark and are often covered with moss on at least one side. On the edges of wet temperate rain forests in the Pacific Northwest, the trunks of bigleaf maples can be completely covered with moss, appearing almost furry. The leaves come down in massive numbers in the fall, contributing large amounts of biomass to the forest floor.

Uses: Bigleaf maple is one of the harder woods in the Pacific Northwest. It makes excellent firewood that puts out lots of BTUs after being seasoned. It can be split into very good kindling, and even though it is hard, it can be used in friction fire. The young bigleaf maple shoots or suckers make excellent hand-drill stalks (especially when used with a western red cedar

fireboard). A bow-drill kit can be made from bigleaf maple, but due to the wood's hardness is difficult to use.

DOUGLAS FIR

Pseudotsuga menziesii

Where found: Dominant tree in Pacific Northwest forests, found in other areas of North America in some forests, especially at elevation. Individuals can be found from Canada to parts of Mexico.

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Description: Douglas fir trees are the main tree found all over the Pacific Northwest both historically and today due to its popularity as a timber tree. Douglas fir trees are not true firs, though they do resemble them with big, flat needles and large cones. The cones are distinctive, with spaces between the scales and a three-pronged bract that sticks out resembling small mice

feet and tails. These evergreen trees vary between being medium-sized and massively tall (up to 250 feet). There are some claims that Douglas fir trees in the past were taller than the tallest redwood trees, and there is some evidence that the tallest tree ever cut down was a Douglas fir. The bark is full of sap bubbles when young, but as it matures it becomes thick and durable, with deep furrows. The mature bark is extremely fire resistant, allowing trees to survive fire events. As the tree matures, its lower branches die and fall off (unlike hemlock), and mature trees have the distinctive feature of having their lowest branches quite high off the grand (easily over 20 feet to the first branches).

Uses: Douglas fir makes incredible firewood. It can be both excellent kindling and fuel. It burns hot and a little fast, but it produces a good number of BTUs. If aged properly, it burns clean, producing little smoke.

Naturalist note: Douglas fir is the main tree harvested and planted by the timber industry. It is considered by many the perfect timber tree due to how fast, tall, and straight it grows. There are innumerable “forests” in the Pacific Northwest that are made of stands of exclusively replanted Douglas fir trees. It is not in any danger of being overused or overharvested.

RED ALDER

Alnus rubra

Where found: Throughout the western United States but especially the Pacific Northwest in second- or third-growth forests. Thriving in disturbed sites, it is often the first tree to recolonize a cut or disturbed area, and is essential for growing new forests due to its ability to add nitrogen to the soil.

Description: A medium-sized deciduous tree characterized by its grayish bark, tooth-edged leaves, and the production of alder catkins, which bear a strong resemblance to small pine or hemlock cones. Alder grows quickly but also dies relatively young and does not produce very large individual trees over time. The “red” in red alder’s name comes from the color of the inner bark and also the reddish color of a tea or bark solution.

Uses: Alder can make an effective bow-drill kit if the wood is sufficiently aged and dried. It also makes good firewood for specific purposes. While it is difficult to get a fire going with alder (it’s best to use another wood for kindling), once it gets going it burns slowly for a long time, producing consistent heat. This makes it a good wood for burning in a woodstove. Punky, wet alder wood is also a traditional wood used for smoking fish and meat. The meat is hung above a small fire that is allowed to burn down to coals and then the alder is put on top of the coals, producing a flavorful smoke.

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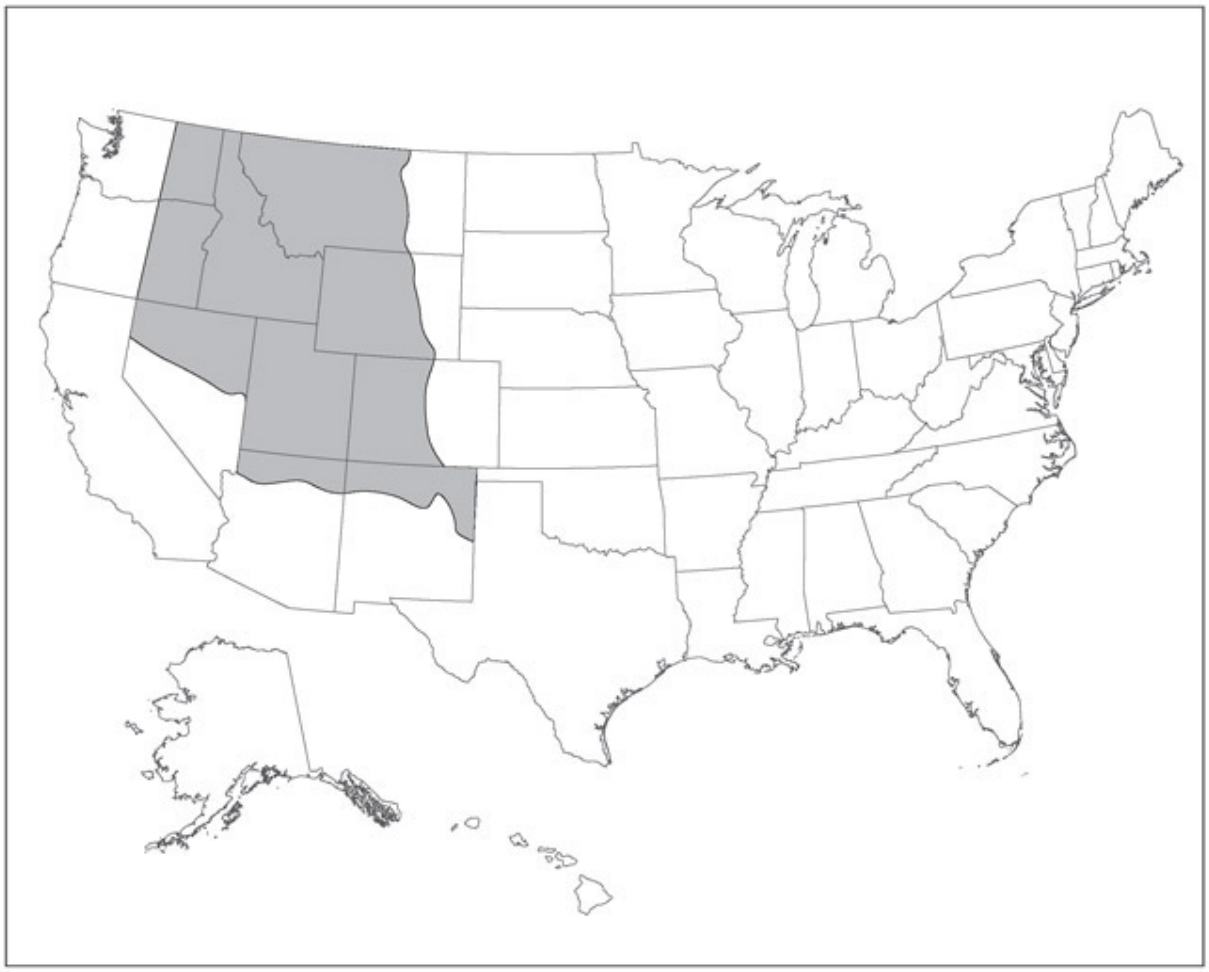
MOUNTAIN WEST BIOREGION

MONTANA, WYOMING, COLORADO, IDAHO, UTAH, NEVADA, CALIFORNIA, OREGON, WASHINGTON, NORTHERN NEW MEXICO, AND NORTHERN ARIZONA

This region includes much of what we think of as the Rocky Mountains and adjacent areas. It includes states such as Montana, Wyoming, Colorado, Idaho, and parts of Utah, Nevada, California, Oregon, Washington, and even northern New Mexico and Arizona. It is characterized by dry conditions, open valleys, and rocky mountain peaks.



BLACK COTTONWOOD

Populus trichocarpa

Where found: Near rivers, open meadows in wet sections, and valleys, almost always near water throughout the American West.

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Description: Black cottonwood, also known as California poplar or balsam poplar, is one of several closely related cottonwood tree species (including quaking aspen) found throughout North America. The species are often similar in appearance. The black cottonwood is typical of the group, being a deciduous leaf-bearing tree with relatively large waxy, green, heart-shaped leaves. The leaves turn a distinctive golden yellow in the fall. The bark of the tree is gray with lenticels and becomes quite thick as the tree gets older. Most cottonwoods do not live a long time, but some individuals have lived close to 400 years. The trees release a distinctive cotton-like seed in the later spring/early summer on warm days. During this time of seed distribution, it can look like it is snowing with cotton in the air, on the ground, and even in the water near the trees.

Uses: Cottonwood's inner bark makes absolutely incredible tinder, especially if harvested in the summer or other dry times. In a drier climate like the Rocky Mountains or during the dry season elsewhere, cottonwood roots are an amazing material to make a friction fire kit, both for bow-drill

and as the fireboard or hearth for hand-drill. The fluffy seeds of cottonwood are quite flammable, and if harvested in sufficient number can be a great addition to a tinder bundle. Branch and trunk wood can also make good fire kits if sufficiently dry.

Naturalist note: Cottonwood trees almost always grow near the edge of water. If you can learn to identify them from a distance, you can find water from as far as a mile away. The trees have a tendency to drop limbs on hot sunny days, and so it can be hazardous to spend too much time nearby. Finally, cottonwood usually (though not always) makes a poor firewood for fuel due to the amount of water the tree absorbs from the ground.

SAGEBRUSH

Artemisia tridentata

Where found: Grows prolifically in open areas across the American West including eastern Washington, Oregon, and California and throughout the entire Rocky Mountain region (especially at lower elevations). One of the most common plants in the lower elevations of the Rocky Mountains.

© iStock/Getty Images Plus/Doug McConnaha

Description: A knotty and often gnarled shrub that grows between knee and waist high, sagebrush is characterized by its silver, sage-like leaves. The leaves have three lobes, which give rise to the *tridentata* (Latin for "three leaves") portion of its scientific name. Also, the leaves are extremely pungent and aromatic when crushed. While there are several other *Artemisia* species in the American West, *Artemisia tridentata* is the most common and distinctive (with its leaves, size, and shape).

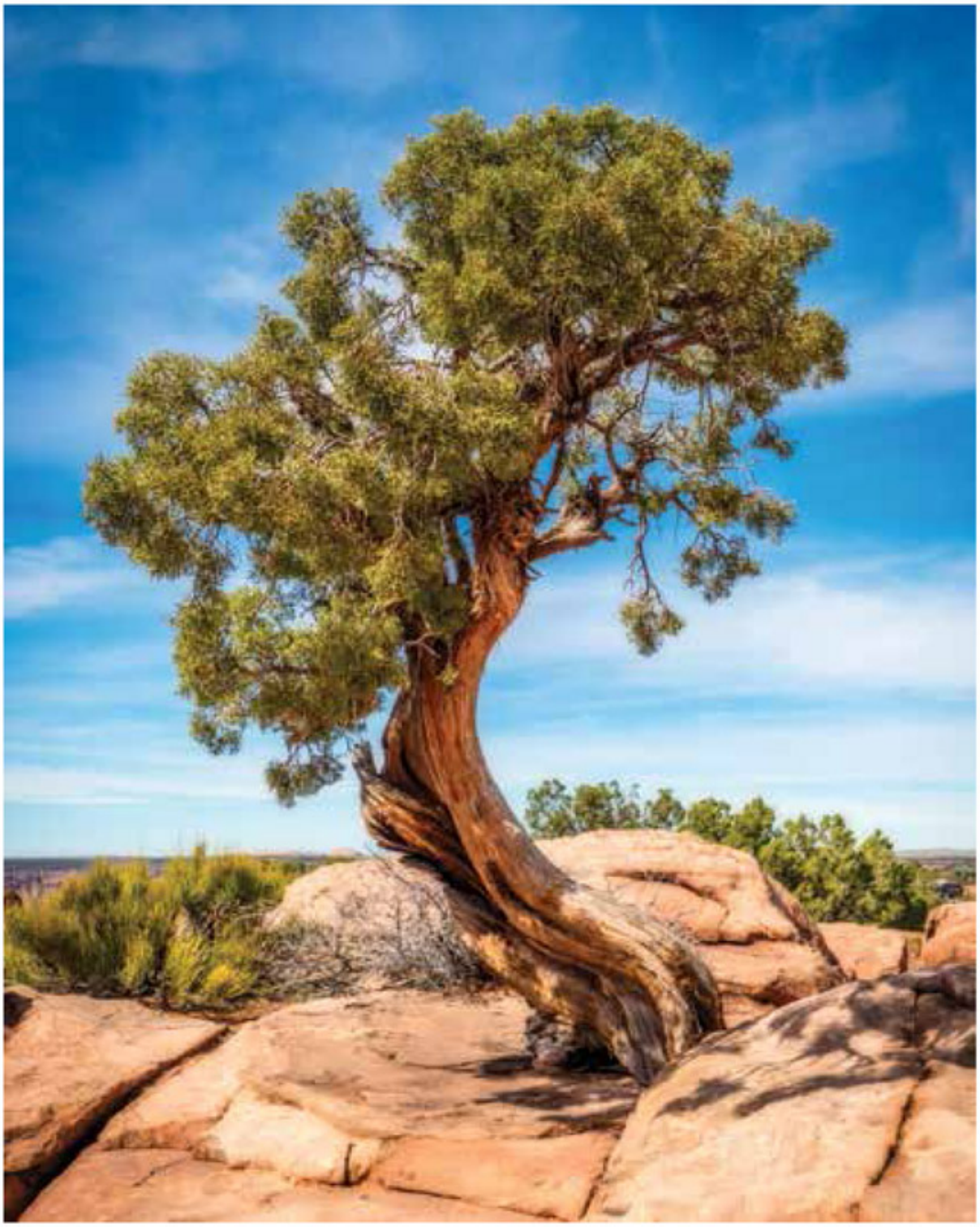
Uses: While sagebrush can be difficult to harvest due to the contorted way it grows, it is possibly one of the best woods for making a friction fire kit in North America (maybe in the world). I've seen people get a bow-drill coal in under 10 seconds with a good sagebrush kit. The wood of the shrub makes excellent material for a fireboard and spindle. It is difficult to carve into specific shapes, so you may have to search for a while to find a piece long enough to make into a fireboard. The wood can also be burned as firewood, though it doesn't grow very big or thick and burns fast. Finally,

the silvery leaves that give sagebrush its name are also excellent tinder for making a fire.

ROCKY MOUNTAIN JUNIPER (AND RELATED SPECIES)

Juniperus scopulorum and others

Where found: Mid to high elevations in rocky conditions throughout the American West, especially in the Rocky Mountains, but also in parts of Washington, Oregon, California, and the Desert Southwest.



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Description: This small to mid-sized conifer includes several different varieties that grow in North America and across the world. Junipers are

characterized by their small to medium size, sharp and small needles, distinctive blue-gray fruits (which are used to flavor gin), and reddish-brown wood. Some species, such as the Rocky Mountain juniper, have shaggy bark similar to western red cedar.

Uses: Juniper species are burned all over the world as an excellent firewood. The wood is extremely aromatic, and with some species the bark or wood is ground up to make various kinds of incense. The wood can be a little hard to make into a fire kit, but it is possible to use for bow-drill. The bark is often very fibrous and can be harvested to make a useful form of tinder.

Naturalist note: Most juniper species produce a small, edible, blue-gray berry. They are edible and medicinal and taste like gin. Eating them in small quantities makes an excellent wilderness snack and survival food.

SPRUCE AND FIRSPECIES

Picea and *Abies* spp.

Where found: Mountainous regions throughout the United States including subalpine areas and lower elevations surrounding mountains.

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Description: It may be unfair to group these trees together, but they are commonly found near each other. They are closely related, look similar, and have similar uses. Spruces and firs are part of the pine family and are true conifers (producing cones). Both can grow up to 200 feet tall but are often much smaller than that, especially at subalpine levels. Both trees have short, somewhat firm needles. Fir trees are characterized by *flat* needles that are softer than spruce. Spruce needles are hard, sharp, and uncomfortable to touch. They are distinguished this way by the saying, “Fir is flat and friendly. Spruce is sharp and spiky.” Fir cones grow upward on their branches, and spruce cones hang down. Both cones are fairly large, growing over 6 inches long in some species. Both firs and spruces are very resinous, producing large amounts of pitch, and young trees often have “bubbles” in their bark filled with flammable pitch.

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Uses: Harvesting pitch from fir and spruce species is extremely helpful, especially when trying to get a fire started in rainy or snowy conditions. The pitch may be smeared on small twigs or tinder to help get a fire going. There are also sometimes large bundles of dried, dead branches growing on the undersides of the tree to harvest for kindling. Fir and spruce make adequate firewood, but they are highly resinous and don't produce the kind of heat you see in harder woods. It is possible to make friction fire kits out of spruce or fir, but they can be challenging. The wood needs to be good and dry to get them to work effectively.

Naturalist note: Different species of spruce and fir are found circumpolar and throughout the boreal north. They are both used as Christmas tree species, and their importance as a wood resource for people living in northern climates goes back to ancient times. Ironically, Douglas fir is not a true fir and does not belong to this group!

CALIFORNIA

A couple of quick notes here to pay attention to: California is an immense area. Just like Texas, it actually encompasses several bioregions. The northern part of the state is part of the Pacific Northwest/Cascadia bioregion. The southern part of the state and especially the southeastern part of the state have a huge overlap with the Desert Southwest bioregion in terms of species and climate. The eastern side of the state, which tends to be hot, dry, and somewhat high in elevation, has a huge overlap with the Rocky Mountain bioregion. Those sections will be helpful when exploring useful species for fire in California. This specific section will focus on the central and western part of the state (still an immense area) with its Mediterranean-like climate.

CALIFORNIA BUCKEYE

Aesculus californica

Where found: Grows along the central coast and the lower elevations of both the Sierra Nevada and the Cascade Mountains. Can grow in a variety of conditions, from moist canyon bottoms to dry slopes and hilltops.

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Description: This large shrub or small tree is the only species of buckeye or horse chestnut that grows in the western United States. It has gray bark and is often multi-trunked. Its most defining features may be its extremely large, spiky white flower and the unusual fruit or nut called a buckeye or horse chestnut. These nuts are toxic to livestock and people, and were traditionally used to poison fish in streams. They can be processed into a food after boiling and leaching the nuts for several days (similar to acorns). The leaves of the tree are dark green with five leaflets and finely toothed. They are delicate and prone to damage.

Uses: California buckeye (like the related Midwestern species) makes excellent material for creating a friction fire kit. You can use it for both the spindle and the fireboard for a bow-drill kit or you can make an excellent fireboard for a hand-drill kit. Buckeye makes poor firewood for burning.

BLUE ELDERBERRY

Sambucus cerulea

Where found: This is a common shrub found all over California. It grows all the way from southern Oregon to Baja and is found on both the east and west sides of the state. It can tolerate both dry and wet conditions, though it prefers access to some moisture.

Description: This ubiquitous shrub can get quite large (up to 30 feet tall). It is characterized by its buttery yellow foam-like flowers, its purple-blue medicinal berries, its tendency to grow in large bunches of cane-like trunks, and its distinctive leaflet structure where leaves grow opposite each other (as opposed to the more common alternate).

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Uses: Elderberry does not make good firewood, but the stalks when dried are useful for friction fire. The younger, thinner stalks make a great hand-drill, and the older, more mature, thicker stalks can be used for bow-drill (with a relatively soft fireboard).

Important naturalist note: The berries of this species of elderberry and other blue or black elderberry species are medicinal and edible. *However, the leaves, stalks, and seeds are all toxic*. There are anecdotal stories of children needing emergency medical care after making a flute of the fresh stalk.

OAK SPECIES INCLUDING VALLEY OAK, INTERIOR OAK, BLUE OAK, AND COAST LIVE OAK

Quercus species

Where found: Almost everywhere. There are over twenty different oak species native to California, and they are known to hybridize.

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Description: Oak trees are characterized by their many lobed leaves, knotted and gnarled trunks and branches, and distinctive fruits: acorns. Commonly they are divided into two broad categories: white oaks, which have rounder lobes on their leaves; and red oaks, which have sharper lobes. Black oaks are another sub category; the name refers to the extremely high tannin level in the acorns, which are usually quite dark.

Uses: Oaks produce extremely hard wood. In fact, it is almost comical to try and get a friction fire with an oak set. If you can produce a coal with wood this hard, it is a true testament to a high level of skill. However, oak makes incredible firewood. It burns hot and long, and is excellent for woodstoves, fireplaces, and outdoor fires.

PACIFIC MADRONE

Arbutus menziesii

Where found: Coastal forests from northern California all the way to San Diego. Usually in a mixed forest with Douglas fir and mixed-oak species.

© iStock/Getty Images Plus/Pacific Northwest Sailing

Description: Madrone has distinctive orange-yellow-red bark that peels off in layers and reveals an incredibly smooth trunk underneath. It also has large, oval-shaped, rubbery-looking leaves that do not get released all at once like most deciduous leaf-bearing trees. It retains its leaves, dropping them gradually, more like an evergreen species.

Uses: Madrone is a wood even harder than oak! Though not great for making fire kits, it is one of the woods that produces the most heat in all of North America. It makes intensely hot and long-burning fires with just a small amount of wood. In fact, many woodstove warranties will note that the warranty is void if madrone is burned.

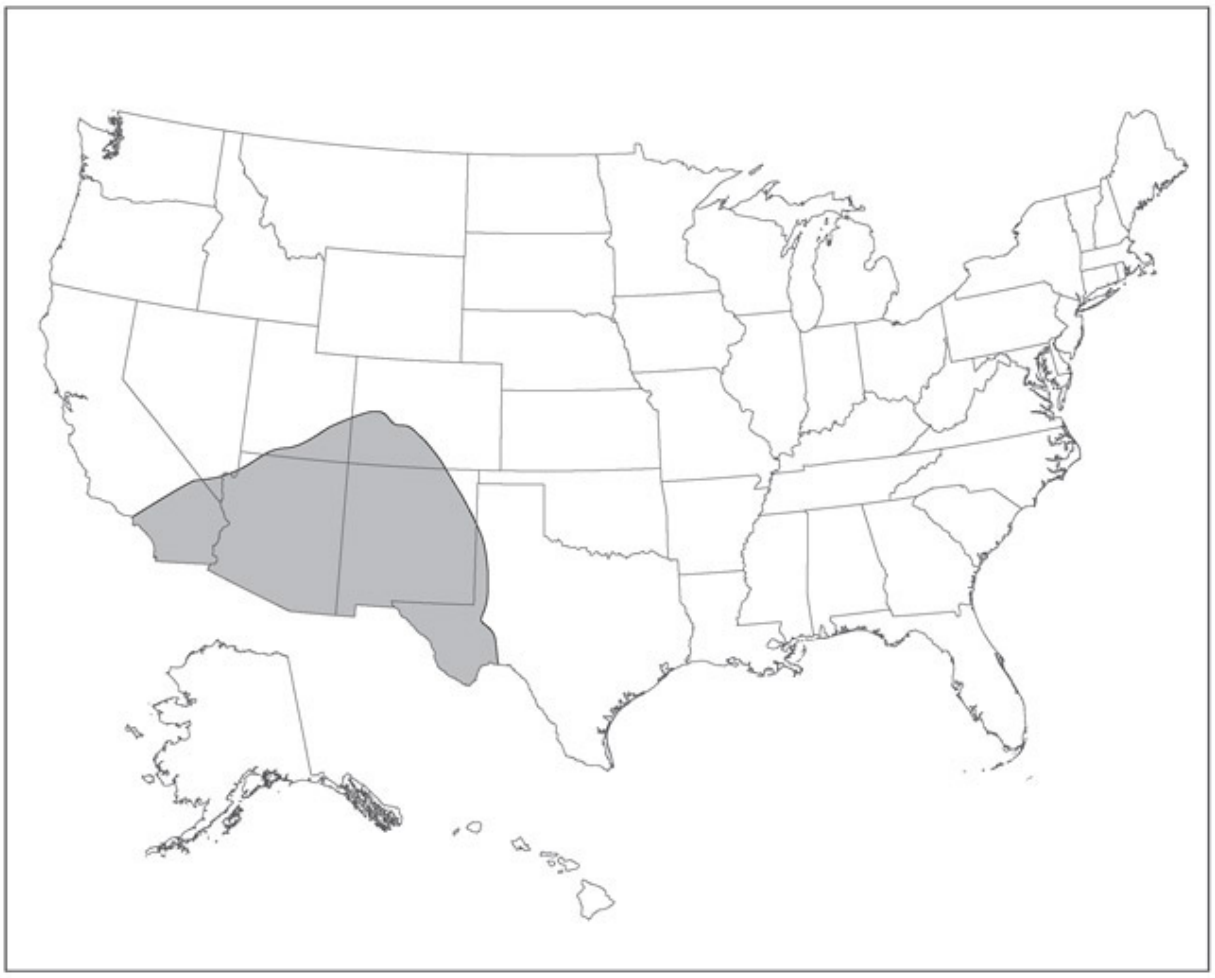
Naturalist note: Madrone berries are an incredibly gorgeous reddish orange. They are tangy, sweet, and sometimes mealy. They also can be strung while fresh and made into necklaces or bracelets as they dry over time.

Other useful species for California: western red cedar, bigleaf maple, Douglas fir, sagebrush, cottonwood, quaking aspen, and juniper.

DESERT SOUTHWEST BIOREGION

INCLUDING BUT NOT LIMITED TO SOUTHEAST CALIFORNIA, ARIZONA, NEW MEXICO, WEST TEXAS, SOUTHERN UTAH, AND SOUTHERN COLORADO

This bioregion can be tricky to describe. It is primarily characterized by arid or very dry conditions, usually with an average of 10 inches of rain per year and sometimes less than 5 inches. However, it includes a great variety of plants and terrains, from red-rock canyons to flat, dry, cactus-filled deserts to higher, dry, mountain areas. There's a tremendous number of different trees and plants, and, not surprisingly with the dry conditions, it's a great place to gather materials for fire.



SAGUARO CACTUS

Carnegiea gigantea

Where found: All over the Sonoran Desert including Arizona and into northern Mexico. Especially prevalent in flat, open, sunny, mostly arid conditions.

© iStock/Getty Images Plus/Kjschoen

Description: This large cactus is distinct and unmistakable. It is the classic stereotypical cactus, with a central upright green trunk and multiple U-shaped arms coming off the central trunk. It is covered with large, sharp spines on its ridges, and it produces both a creamy white flower and a distinct red-purple fruit, both loved by birds and bats.

Uses: It's kind of odd to includes this species here since it is illegal to harvest and use unless on private land. But these laws are in place to protect living saguaros. For fire-making use, you should look for the dead and downed "skeletons" of a saguaro. The ribs of these skeletons make incredibly useful material for making a bow-drill kit and can be used for other forms of friction fire as well. The kits I made from saguaro ribs were some of the best, most consistent, and fastest friction fire kits I've ever made or seen.

Naturalist note: Saguaros grow very, very slowly. A typical 15- to 20-foot cactus is almost certainly over 100 years old, and quite likely older. It is important to respect this valuable, unique plant. However, it is also quite

easy to find many old dead saguaro skeletons on private desert land by exploring just a little bit—with permission, of course.

YUCCA SPECIES

Yucca varieties

Where found: It can depend on the exact species but generally rocky, dry desert conditions. Varieties of yucca are usually thought of as desert plants, but some varieties grow as far north as Canada and in tropical conditions including in the Caribbean.

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Description: Yuccas, members of the asparagus family, are characterized by tough, sword-like leaves that grow in a rosette shape from a central base. The leaves are often serrated or sharp. The creamy yellow-white flowers

grow on a relatively soft, woody stalk. Notable examples of different yucca species include Joshua trees, Spanish bayonet, Arkansas yucca, spoonleaf yucca, and banana yucca.

Uses: The different varieties of yucca can be extremely useful in getting friction fire. The fibers from the leaves or the dried leaves themselves make excellent tinder. The flower stalk can be used as either a hand-drill or a bow-drill for a fire kit (usually combined with another wood for the fireboard). Depending on the relative thickness and hardness of the yucca shaft, you may be able to make a full hand-drill kit with yucca serving as both fireboard and hand-drill. Similarly, you can use the harder, firmer shafts for both the spindle and the fireboard of a bow-drill kit. There are not many species around that you can do this with.

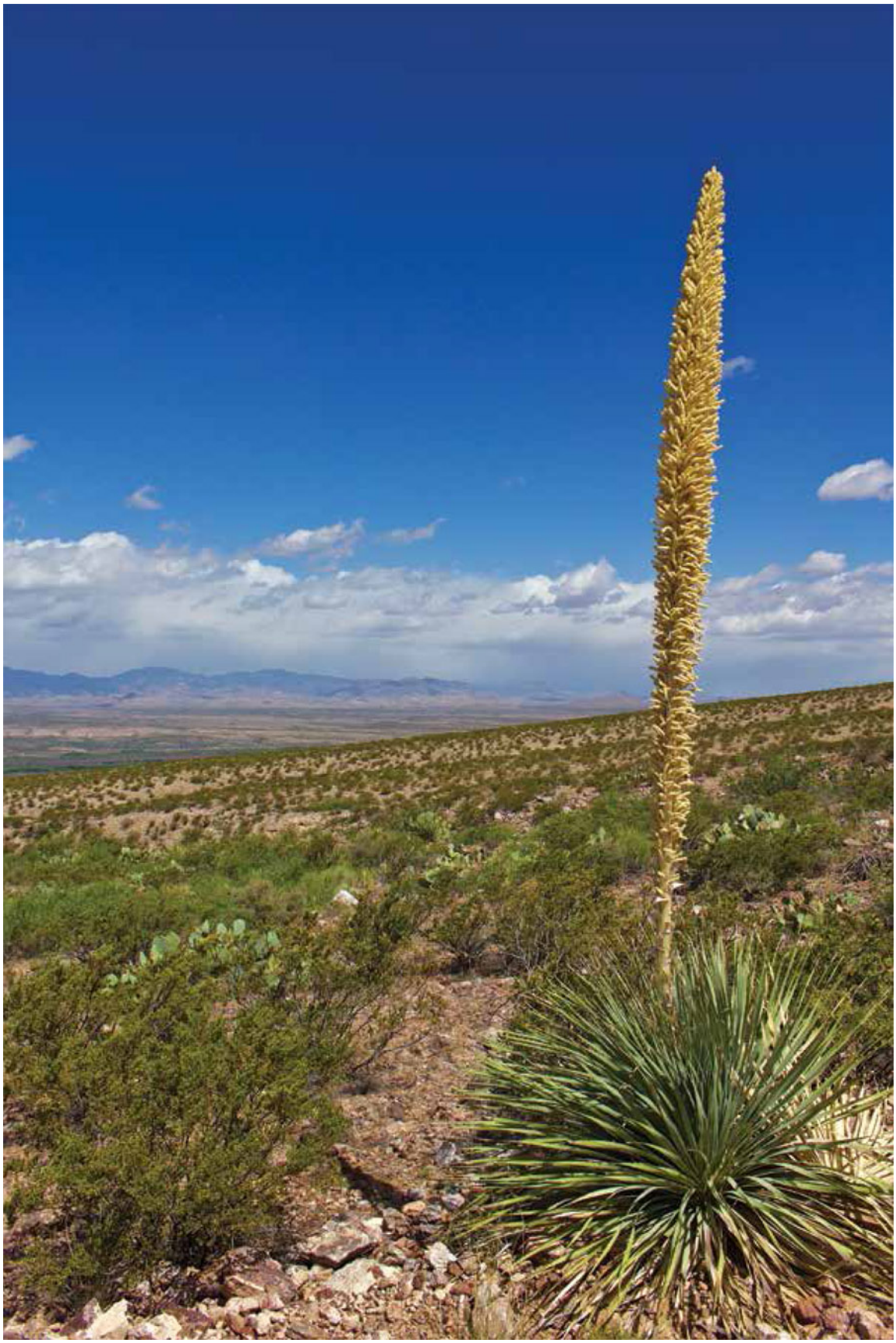
SOTOL OR DESERT SPOON

Dasylirion wheeleri

Where found: Dry desert, open areas, including desert washes.

Description: Sotol or desert spoon looks similar to yucca. It is in the same asparagus family, and it grows in a rosette shape with tough, sharp, spiky leaves. The edges of sotol leaves have a distinctive spoon-like shape, hence one of its common names. Sotol also grows a flower stalk that is creamy white or soft yellow with a white-colored flower for the male and a pinkish-purple flower for the female. Honestly, I don’t know why sotol is not classified as a yucca.

Uses: Sotol or desert spoon is used similar to yucca for making fire . . . only it’s way better (which is saying a lot considering how useful yucca is). The sotol stalk makes an incredibly good fireboard for both bow-drill and hand-drill kits. The fastest friction fire kits I’ve ever seen have all had sotol as part of the kit. The thinner stalks can be harvested and used as part of a fire-plough kit as well.



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SEEP WILLOW OR MULE FAT

Baccharis salicifolia

Where found: In both the Desert Southwest and sagebrush scrublands of the American West. Usually found near water or in dry washes.

Description: This medium to largish bush has sticky leaves and plentiful small, white or pink, fuzzy flowers. Butterflies love the flowers, and that's one way of locating the bush. The bush has long, pointed leaves. The branches grow in distinct vertical, straight lines from the trunk. This produces an almost perfect natural hand-drill. The thickness and straightness of the branches is so striking that it seems like the plant was designed for making fires or arrows.

Uses: Seep willow or mule fat (two very different and distinct common names for the same plant!) has a low ignition temperature similar to long yucca stalks. It can be used to make incredible natural hand-drills that require little to no modification. Sometimes you can literally break a branch off and start using it as a hand-drill. The thicker branches can be harvested for bow-drill spindles as well.

Naturalist note: Sotol and seep willow are a magical combination for hand-drill friction fires. They work together to create a coal more easily than any other combination out there. Seek out these species for teaching beginners hand-drill. The combination is easy and effective in many sizes and in different circumstances.

MESQUITE

Prosopis spp.

Where found: Dry open deserts, scrublands, and in washes.

© iStock/Getty Images Plus/Darren E. Tromblay

Description: Mesquite is the common name for many different plants that are all bean- and pod-producing trees—and all part of the genus *Prosopis*. Generally their leaves are leaflets that are a light-colored green or even blue. Their distinctive feature is the fruit, which is the aforementioned bean covered in a distinctive green pod. Many of the varieties have big, sharp thorns.

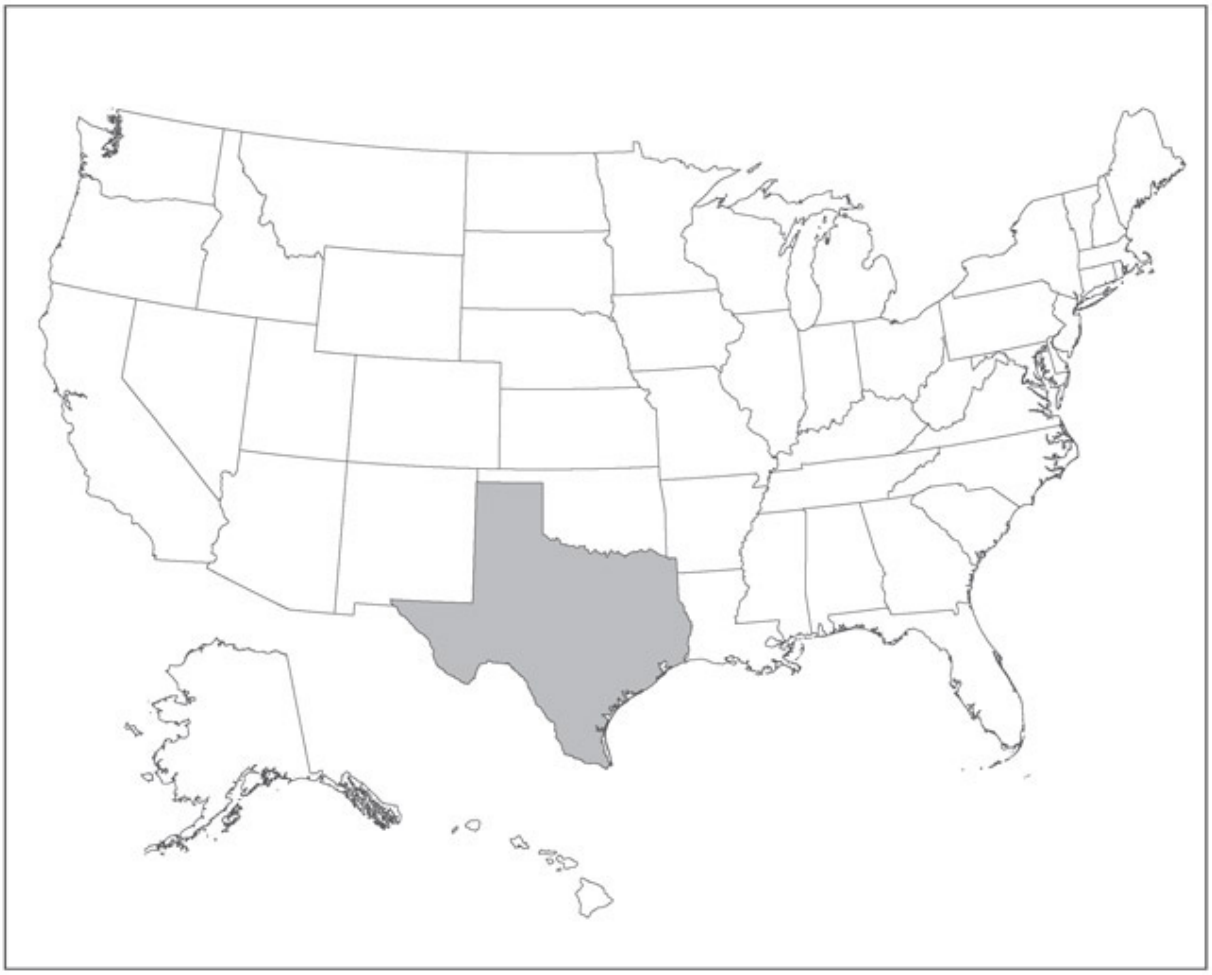
Uses: Mesquite makes good hot firewood, and often in the areas where it grows it is the only firewood available. The sticky sap is also quite useful for getting a fire going, and it has an incredible aroma. Some tribal groups used the dried sap as a form of incense. Small amounts of mesquite are often added to a smoking mixture in traditional smoking and barbecuing of meat. In many areas outside the Desert Southwest, mesquite is considered an invasive species. Removing it can be helpful to local native species.

Naturalist note: Mesquite trees have an unusual edible aspect to them. The bean pods—not the beans themselves—are often edible, provided they haven't gotten too hard to consume. The fresh green pods can be chewed and sucked on, producing a moist, sweet flavor that's refreshing in the dry, desert heat. The pod is usually spit out after it's been chewed for a while. The dried pods can be ground and used as a sweet flour or made into a refreshing, soothing drink. This is how the Tohono O'odham, the Native people of southern Arizona, use them traditionally.

Other useful species found in the Desert Southwest, especially in higher desert elevations: Rocky Mountain juniper, Freemont cottonwood (similar to black cottonwood), Gambel's oak (similar to the varieties of California oak), and quaking aspen (similar to cottonwood).

TEXAS

Like California, Texas encompasses an enormous area with diverse regions. It has dry, desert areas in the west and southwest portions of the state; rolling hills, plains, and small forests in the north and east; and even some overlap of tropical and swamplands. There are many tree and plant species found across this immense area. Here are some of the most useful.



ASHE JUNIPER
Juniperus ashei

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Where found: Loves rocky, well-drained soils including sandy and clay conditions. Grows all over central Texas as well as into Oklahoma, Missouri, and south to Mexico.

Description: This evergreen shrub or smallish tree is similar to other species of juniper. Its branches tend to grow in wildly twisted shapes, and it can form dense thickets. It has small, scale-like, fragrant needles, grayish-blue fruit, and shaggy bark.

Uses: The shaggy bark is extremely good for tinder, and it is easy to harvest in large amounts. A unique characteristic of this shrub/tree is that the way it grows makes it ideal for harvesting branches for the bow of a bow-drill kit. While it is not often difficult to find a curved branch from a tree, finding a single species that has dozens of useful limbs is pretty rare. The wood is fragrant for burning, but it burns quickly and usually needs to be combined with another wood that burns slower.

CHINABERRY

Melia azedarach

Where found: Open scrublands, grasslands, deserts, and near washes. Introduced from India and Australia, it now grows over much of the world including Asia, Africa, and the Americas.

© iStock/Getty Images Plus/Esteban Nartinena Guerrero

Description: This invasive tree is characterized by its super-large leaves (sometimes up to 20 inches long). The leaves are a dark green above with shades of lighter green underneath. The edges of the leaves are serrated. The flowers are small and pale purple, grow in clusters, and are quite fragrant. The bark on younger trees is smooth and may have a reddish cast. It gets darker, browner, harder, and more furrowed over time. The fruit, which is about the size of a marble and yellowish, is toxic to humans and livestock. Over time its color fades to a white-yellow.

Uses: It's always nice to be able to harvest an invasive species for fire. While the leaves and berries of the tree are toxic, you can safely harvest branch wood and other wood for bow-drill fireboards and spindles. It's the kind of wood that even kids sometimes can get coals with. However, due to the overall toxicity of the wood, I would not use it for any sort of container or burn it.

Naturalist note: Even though the fruits or berries are toxic, they've been traditionally used as an insecticide specifically for protecting fruit. The dried berries can be stored near apples or other fruit, and the chinaberry's presence discourages insect pests.

POST OAK

Quercus stellata

Where found: Poor dry soils across much of the southeast United States and parts of Texas.

Description: Post oak is a relatively small tree in the white oak grouping. It cross-pollinates with other oaks (as most do), but it is characterized by the round, soft-shaped terminal lobes of its leaves. The terminal lobes grow almost perpendicular to each other in a cross-like configuration. The leaves are hairy on the underside. These two characteristics make it easy to identify when compared to other oaks. The acorns are just over a half inch in size.

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Uses: Post oak makes great firewood. It burns hot and long, and it is also easy to split (a combination of elements that can be difficult to find).

JAPANESE LIGUSTRUM OR PRIVET

Ligustrum japonicum

Where found: Another introduced and invasive species, this tree grows all over the southeast United States, from Texas to Virginia.

© iStock/Getty Images Plus/lurii Garmash

Description: This evergreen shrub grows up to 16 feet and has pale gray-brown bark on its stems. The leaves are broad, glossy, thick, leathery, and dark green on top with a lighter yellowish green underneath. Uncommonly, the leaves grow opposite each other (most species' leaves grow in an alternate pattern). The flowers are four-lobed, grow in clusters, and are white. The fruit is purple-black and ripens in early winter.

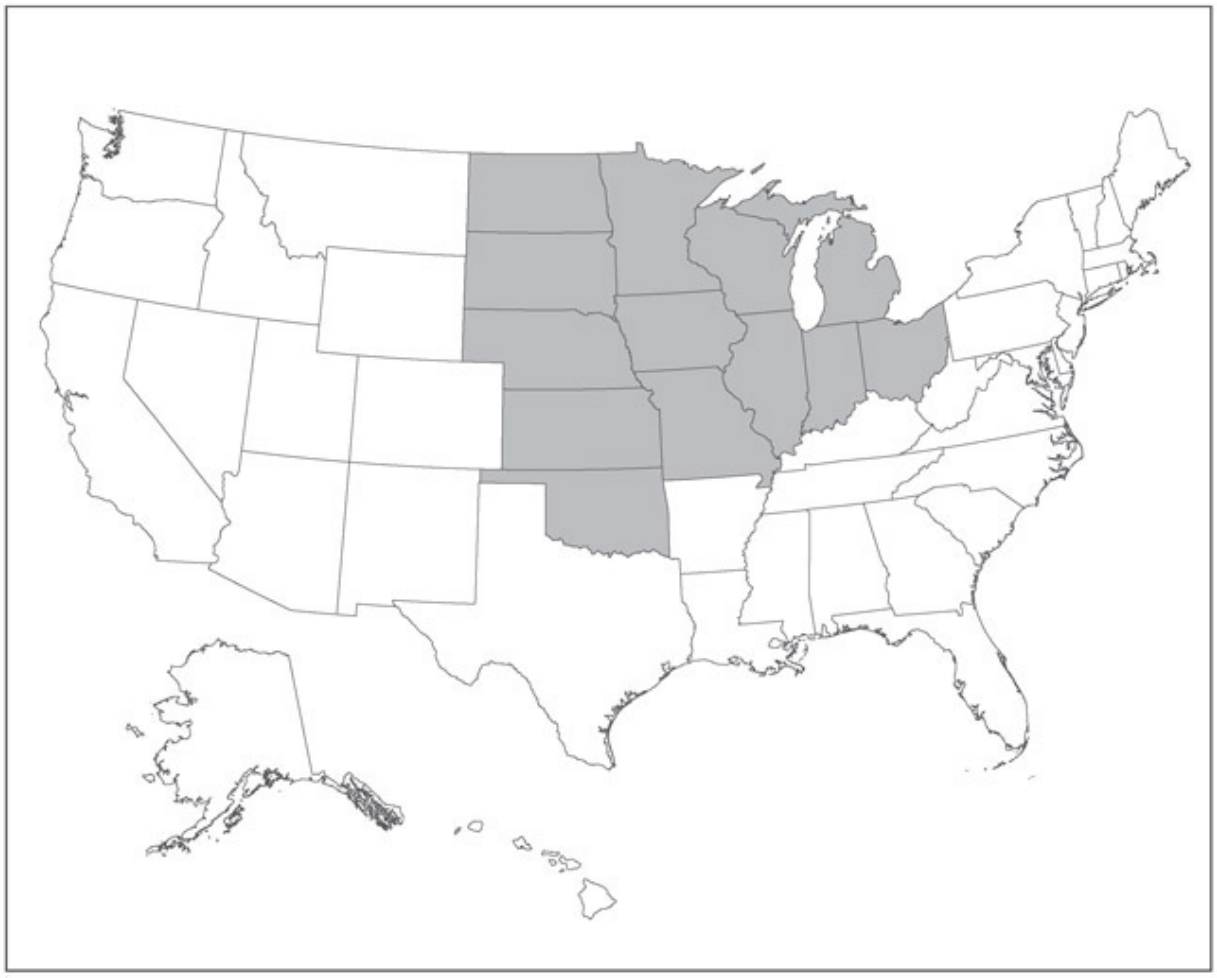
Uses: Another invasive tree that is widely naturalized, Japanese Ligustrum or privet is useful for making bow-drill kits and fires. It makes good spindles in particular, and you can harvest the dead, dry branches right off the tree.

Naturalist note: Unlike chinaberry, the fruit is not toxic, and in fact is an herbal remedy used in both Chinese and Japanese medicine.

MIDWEST BIOREGION

OHIO, INDIANA, MICHIGAN, WISCONSIN, MINNESOTA, IOWA, MISSOURI, ILLINOIS, NEBRASKA, KANSAS, NORTH DAKOTA, SOUTH DAKOTA, AND OKLAHOMA

The Midwest bioregion is a difficult one to describe and define. It encompasses a wide geographic area, from states that are part of the eastern forest bioregion such as Ohio, Indiana, and Michigan to states that are prairie dominant such as Nebraska, Kansas, and the Dakotas. The large area has significant overlap of flora with other regions described in this chapter. I will focus here on specific species that are found in the area, but please realize that many of the plants found in the northeast section of the book and the mountain west can be found here as well, depending on where you are.



EASTERN RED CEDAR

Juniperus virginiana

Where found: This is actually a juniper species that is common all over the eastern part of North America. It is found in forests, rocky areas, small mountains, rolling hills, and near drainages.

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Description: This slow-growing, dense evergreen shrub or tree is actually not a cedar but rather an eastern variety of juniper. Sometimes it is only the size of a small bush. It can also grow over 60 feet tall. The bark is reddish brown, very fibrous, and peels off easily. The needles are sharp and less than 0.5 inch long. They are arranged in opposite pairs or sometimes whorled around a branch. The seed cones are small, up to 0.25 inch long, and are dark purple and berry-like. They are a variation of the juniper "berries" found out West and are loved by birds. This tree is a pioneer species, meaning it is often the first to grow in a disturbed area. Unlike many other pioneer species, eastern red cedar does not die off quickly; rather, it can live for quite a long time after establishing itself.

Uses: The shaggy bark of eastern red cedar makes good tinder. The wood can be made into bow-drill kits or serve as a fireboard for hand-drill, but it is not nearly as good as its western namesake (western red cedar), though it is prized for its ability to help get a fire going. Eastern red cedar makes incredibly excellent kindling. It splits easily and burns hot and fast. It helps

catch other denser woods (such as oak), but it burns too fast to be used as the main fuel for a fire.

Naturalist note: Neither western red cedar nor eastern red cedar are actually cedars. Western red cedar is in the *Thuja* genus, and eastern red cedar is a form of juniper. While true cedars are found throughout the United States, they are introduced species from other parts of the world (especially the Middle East). There are no cedar species native to the United States.

YELLOW BIRCH

Betula alleghaniensis

Where found: This species of birch prefers cool, shady, and moist habitats, mostly in the north. It does best on north slopes, in swamps and deep woods, and near streams. It does not tolerate dry and hot conditions well.

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Description: Similar to other birches, yellow birch's most distinguishing feature is its bark. The mature bark is golden yellow (sometimes with some brown) and has a shredded, peeled appearance. It comes off easily when pulled and can be harvested readily in small and large quantities. Yellow birch is the largest of the birch species and grows up to 100 feet tall. The oval leaves have jagged edges and a slight heart shape. The flowers are catkins, and the seed is a winged samara similar to what you see on maple trees.

Uses: Yellow birch, white birch, and sweet birch share some similar properties. Yellow birch's bark peels off easily and makes incredible tinder. It is aromatic and contains volatile, flammable compounds that make it incredibly easy to light, and it is possible to light even when wet. This makes it invaluable for getting a fire in challenging wet conditions. Yellow birch makes good firewood, but it is difficult to split.

Naturalist note: White birch, yellow birch, and sweet birch can all be tapped, similar to a maple tree. The sap can be harvested, cooked down, and made into birch syrup. While not as sweet as maple syrup, it is still quite tasty and full of trace minerals and nutrients. Birch sap has been harvested all across the world for a long time for its medicinal properties. Yellow birch and black birch both have a distinctive wintergreen-like smell that is used to make certain forms of root beer and even birch beer.

NORTHERN WHITE CEDAR

Thuja occidentalis

Where found: Wet forests of the upper Midwest and southern Canada. Loves swampy, coniferous forests. Isolated populations are found throughout the Midwest and eastern forests.

© iStock/Getty Images Plus/Oleg Charykov

Description: Closely related to western red cedar, this *Thuja* is quite a bit smaller and more stunted. It grows to a height of only 50 to 125 feet. It has scaly leaves, fan-like branches, and very small seed cones. Its bark is not as easy to peel as western red cedar or eastern red cedar.

Uses: Northern white cedar is an excellent material for making bow-drill kits or as a fireboard for hand-drill. It splits easily and is quite soft, making it easy to carve. The wood makes good kindling, but in many ways it is considered too valuable to burn.

Naturalist note: Similar to the role that western red cedar plays in the traditional lives of northwest Native peoples, northern white cedar is incredibly important to the Ojibwe and other northern Native tribes. Northern white cedar was used as a traditional medicine and is also used to build cabins, shelters, canoes, and other wooden boats. It’s sometimes nicknamed arborvitae and used as an ornamental tree species.

EASTERN COTTONWOOD AND BALSAM POPLAR

Populus deltoides and *Populus balsamifera*

Where found: These closely related species are found throughout the eastern and central United States. Balsam poplar is found in more northern ranges, and eastern cottonwood is found throughout the Great Plains. Both favor the edges of streams and rivers in wide-open, sunny habitat. In some states, such as Kansas and Nebraska, *this is one of only a few wild trees you can find to use in making fire kits*.

© iStock/Getty Images Plus/Darwin Wiggett

Description: Both of these trees are medium to large and grow relatively fast. They have grayish bark that develops deep furrows as the trees mature, shiny heart-shaped leaves, and resinous buds. The eastern cottonwood is characterized by its seeds, which become airborne in later spring or early summer and resemble cotton flying in the wind.

© iStock/Getty Images Plus/RaksyBH

Uses: The inner bark of these species makes great tinder when dry. It is fibrous and needs to be broken up a bit, but it will make a great “nest” of tinder when prepared right. The branch wood and roots can be made into great bow-drill kits if sufficiently dried and aged. It’s quite possible to find these trees fallen over with roots exposed, dead and dried out, ready to make a good kit right off the land.

Naturalist note: These species are closely related and interbreed to create a third species known as Balm of Gilead. In traditional naturalist studies, people often divide themselves into lumpers and splitters. Lumpers generally like to make large categories of interrelated things. Splitters like to pay special attention to the fine details and make separate, smaller categories based on their observations. There is a general move toward the “splitter” way of doing things in botany these days, and the distinctions

made between black cottonwood, eastern cottonwood, Balm of Gilead, and balsam polar are an example of this trend.

NORTHEAST BIOREGION

MAINE, VERMONT, NEW HAMPSHIRE, MASSACHUSETTS, CONNECTICUT, RHODE ISLAND, NEW YORK, NEW JERSEY, DELAWARE, PENNSYLVANIA, MARYLAND, VIRGINIA, AND WEST VIRGINIA

This region includes what is often referred to as New England, extending from Maine all the way south to Virginia and west to the edges of midwestern states such as Ohio. It is characterized by eastern woodlands, older smaller mountains, and many small microclimates and ecozones.

BASSWOOD

Tilia americana

Where found: All over the entire eastern part of the United States. In particular, it is the dominant tree species in sugar maple-basswood forests.

© iStock/Getty Images Plus/MariusFM77

Description: This fast-growing deciduous tree is medium to large in size, growing up to 120 feet at full maturity. It can grow twice as fast as beech and birch species. The bark of the tree is grayish brown or sometimes just light brown, with deep grooves or fissures. The leaves are a fairly dark green, grow in an alternate pattern, have toothed margins, and are almost heart shaped. The flowers are small, yellow-white, and found in drooping, fragrant clusters. The trees tend to flower in May or June.

Uses: Basswood is one of those trees that seems designed to assist human survival. The bark is fibrous and can be harvested to make incredibly strong cordage, as well as pounded and broken up into tinder. You can use the branch wood of the tree for bow-drill and fireboards. It may be one of the easiest trees in the country with which to make a bow-drill kit. Finally, due to the way the bark grows, you can actually create an entire bow-drill kit from this tree. The spindle, fireboard, and handhold can all come from the branches, or even from parts of the trunk, and you can harvest a curved branch with the bark intact and carefully pull back the bark, leaving it

attached to the branch. This creates a self-made bow with strong cordage attached to complete your kit. *Basswood is the only species I know of that you can do this with*. Basswood can be burned as well, but it burns quickly and does not make the best firewood.

Naturalist note: Basswood was one of the first materials I ever learned to make cordage (hand-made rope from plant materials) with. It is one of the strongest cordage materials in the world. My teacher told a story of using basswood cordage to help pull a truck out of mud it was stuck in. Apparently they created enough basswood rope to attach it to his vehicle, which he then used to help pull out his friend.

ATLANTIC WHITE CEDAR

Chamaecyparis thyoides

Where found: Forested wetlands all along the East Coast from Maine to Florida. Tends to grow within 100 yards of the ocean. Also found on the Gulf Coast. Will grow on small hills in swamps and wetlands surrounded by water.

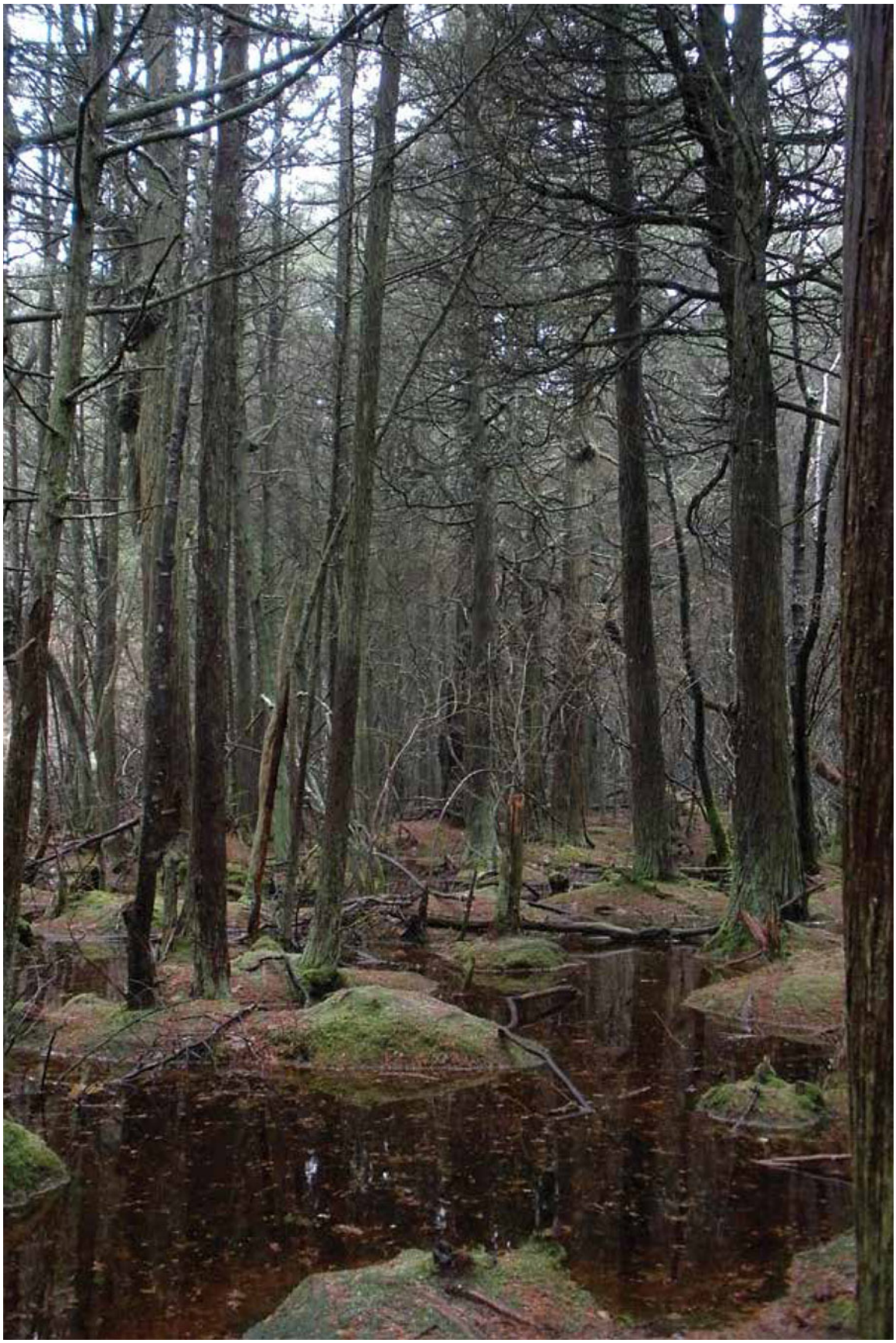
Description: Atlantic white cedar or, as it's sometimes known, Atlantic white cypress is an evergreen coniferous tree. It can grow up to 115 feet tall, with 60 to 90 feet being typical. The leaves are scale-like needles in opposite pairs. The bark is smooth when trees are young but develops thick ridges over time. The cones are small, less than an inch long, and less than half an inch in diameter. Needles and cones look similar to western red cedar.

Uses: Atlantic white cedar makes excellent fireboards for hand-drill. It also is great for both the spindle and fireboard when making a bow-drill kit. The wood splits readily, is rot resistant, and can be made into kindling relatively easily.

Naturalist note: Just like the saguaro cactus, Atlantic white cedar's specialized habitat needs (wetlands near the Atlantic coast for the most part) make this a rarer tree than a lot of other species presented here. I recommend only collecting dead and downed trees from private land unless

you are in the part of Appalachia where this tree occasionally grows abundantly.

Atlantic white cedar actually is not a cedar; rather, it is a cypress that is closely related to Alaskan yellow cedar and Port Orford cedar (both cypresses as well).



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WHITE BIRCH/PAPER BIRCH

Betula papyrifera

Where found: This species is found circumpolar in northern latitudes around the world. In the United States, it is found in the most northern states as well as the northeast corner of the country. It is often the first tree to regrow in a burned area.

© iStock/Getty Images Plus/Johnandersonphoto

Description: This fast-growing deciduous tree is unmistakable due to its white, paper-like bark that peels off easily. It is a short-lived tree, and its

bark tends to get brighter and whiter with age. The leaves are toothed.

Uses: Birch bark may be the most useful natural tinder known to humankind. Like paper it is naturally flammable, but it also contains chemical compounds that make it even more so. These chemicals actually allow birch bark to burn when wet. With birch bark from white birch you have a form of tinder that's truly waterproof. *I've seen people light birch bark on fire after dipping it in water*. Birch also makes excellent firewood, and the paper-like bark has many other uses, including the ability to turn it into useful and even waterproof containers. White birch is on my top ten list of the most useful trees or plants for survival purposes in the world.

EASTERN HEMLOCK

Tsuga canadensis

Where found: Deep, shady forests of the northeastern United States, parts of Michigan and Wisconsin, and south to parts of inland Appalachia.

© iStock/Getty Images Plus/Sieboldianus

Description: Virtually identical to western hemlock with small, scaly cones; short, flat, green needles that are much lighter underneath; and even the same drooping apex, or very top of the tree, which allows one to identify hemlock trees from some distance away. (I secretly wonder if these are actually the same species but are separated by the Rocky Mountains and Great Plains).

Uses: Similar to its western counterpart, eastern hemlock holds a large number of dry, dead branches off the ground. This makes incredible natural kindling that is dry and easily burnable even if it is cold and wet out. It also has flammable pitch, as well as tiny, hairlike branches that can be used as a sort of tinder-kindling hybrid and are handy for getting fires started in challenging conditions. The wood is decent for firewood but not great.

EASTERN WHITE PINE

Pinus strobus

Where found: Throughout the temperate forests of the eastern United States and northern part of the Midwest. Originally, this tree was one of the dominant species of the north-central and northeastern United States, but now less than 1 percent of the original old-growth forests are still around. Plenty of younger trees and forests can be found in the mixed broadleaf and pine forests in the same areas today.

© iStock/Getty Images Plus/Kazakob Anatolii Pavlovich

Description: Eastern white pine is an archetypal example of what we think of as a pine tree. It has large, slightly slender cones up to 6 inches long, evergreen needles that grow in bundles of five, and thick furrowed bark. The trees tend to be resinous and full of sap as well.

Uses: While the main trunk of these trees is usually too pitchy to burn for firewood, the branches often die underneath the upper branches and needles just like on hemlocks. While an eastern white pine tree won’t have nearly as

many dead branches as a hemlock, it will still have a fair amount of dead, dry wood available at all times of the year. Additionally, the trees' pitch is useful for getting fires started under wet conditions, and if dry, both the needles and the cones can be used as a form of tinder.

SOUTHEAST BIOREGION

NORTH CAROLINA, SOUTH CAROLINA, GEORGIA, FLORIDA, ALABAMA, MISSISSIPPI, LOUISIANA, ARKANSAS, KENTUCKY, AND TENNESSEE

This part of the country is often referred to simply as the South. It is characterized by a moist, warm climate that borders on being tropical in the areas that border the Atlantic Ocean. It features verdant swamps, mixed forests of different kinds, coastal areas, and very old, low mountains.

PAW PAW

Asimina triloba

Where found: Well-drained soils in hilly upland habitat or fertile lowland valleys. Found throughout the mid-Atlantic and southeast United States.

© iStock/Getty Images Plus/Igaguri_1

Description: This deciduous small tree/large shrub is mostly recognized by its unique and distinctive fruit. The paw paw fruit is the largest native fruit produced in the mainland United States. It is brown to dark green when ripe, and inside, the fruit is bright orange (somewhat like mango flesh) with large brown seeds. The flavor is reminiscent of mango or banana, and its common name is probably a variation on papaya. Other features of the tree include simple, alternate green leaves, a tri-lobed maroon-colored flower, and light gray bark that has a distinctively unpleasant odor when bruised (some people say it smells like green peppers).

Uses: Besides its amazing edible qualities, paw paw makes excellent wood for creating a bow-drill kit. It can make both a fireboard and a spindle. It also has tough, fibrous inner bark that can be shredded as tinder.

Naturalist note: Paw paw fruit is an important food source for many wild animals including bears, deer, foxes, and squirrels; however, the bark, leaves, and twigs contain natural insecticides that make them unpalatable

for most animals. George Washington liked this fruit as a dessert. Native tribes historically cultivated and tended paw paw.

TULIP POPLAR

Liriodendron tulipifera

Where found: All over the eastern United States and especially the Southeast. Tulip poplar is found in younger forests as an early succession tree, but it can't tolerate intense shade. It is almost entirely absent within older forests, especially any with trees 500 years or older.

© iStock/Getty Images Plus/Magicflute002

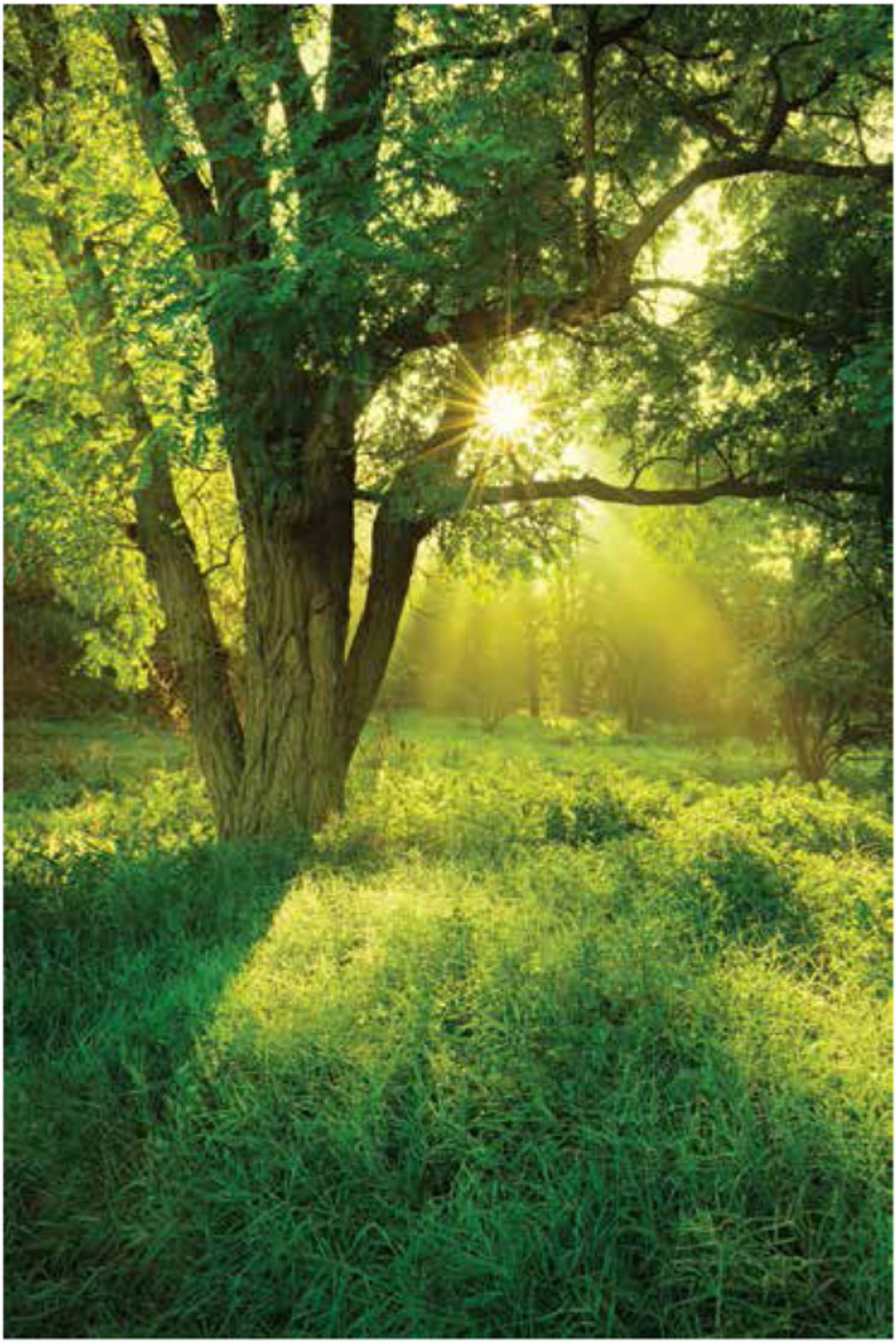
Description: This hardwood, deciduous tree is one of the tallest and largest trees in the eastern United States. It can grow to almost 200 feet, and it grows rapidly. The bark is furrowed and a solid brown. The wood is lightish brown. The leaves are 5 to 6 inches long and wide, with four lobes, and a

box-like shape but also elements of a heart. These leaves are very distinct. Once you learn to recognize them, it is easy to identify tulip poplars.

Uses: Tulip poplar is a pretty incredible all-around tree for fire uses. It can be used to make both the spindle and the fireboard of a bow-drill kit. The inner bark is fibrous and similar to cottonwood bark. When it is dry, the inner bark can be broken up and made into effective tinder bundles. The wood makes decent firewood that burns especially bright for lighting up the night. Finally, due to its wide distribution and abundance, it does not have the same concerns for use as some of the other species described in this book.

BLACK LOCUST

Robinia pseudoacacia



© iStock/Getty Images Plus/AVTG

Where found: Originally the range of black locust was limited to certain sections of the eastern United States, in particular the Appalachian Mountains. The tree is shade intolerant and needs sunlight and dry soil. It is found in young forests and especially in disturbed areas. Ironically, the tree has now been distributed all over the country and the world! It is considered an invasive species in many locales including the western United States, Australia, and South Africa. One of the places you see it quite often in the United States is at highway rest areas, where it has often been planted as an ornamental due to its hardy nature.

Description: This medium-sized tree usually grows between 40 and 100 feet tall. When it is young, its green branches and bark have thorns, while mature trees usually do not. The bark is reddish black or gray with orangeish-red grooves. The leaves have a distinctive compound structure made of between nine to nineteen leaflets. Each leaflet is round to oval and grows opposite another leaflet, except at the tip. The leaves are dull green and paler underneath. Flowers are white and grow in large clumps. They are fragrant and popular with pollinators.

Uses: Black locust is an extremely hard wood—one of the hardest in North America. This makes it a prized wood for construction of fence posts, furniture, and so forth. It is much too hard to make into a friction fire kit, but it is an incredible firewood. It burns slowly for a long time and produces a large amount of heat. It is great in woodstoves or for outdoor fires. Black locust is best when seasoned, but it has a strange property of burning well even when green or wet.

Naturalist note: Due to the widespread distribution of this tree over much of the country and it being considered invasive in many locations, it is a great wood to harvest or procure for firewood. In addition, black locust can be used to make incredible longbows, and I've even heard of it being used to make small boats.

SPICEBUSH

Lindera benzoin

Where found: Spicebush is a common understory plant in the shady moist woods of the eastern United States.

© iStock/Getty Images Plus/Skymoon13

Description: Spicebush is a medium-sized shrub that grows between 6 to 12 feet. It is characterized by its distinctive yellow flowers that grow in clumps around its branches. It also has distinctive red berries. The leaves are dark green on top, lighter on the bottom, and have smooth edges. Both the leaves and the stems have a pleasant aroma that is apparent when they are crushed, which is where the name spicebush comes from.

Uses: Spicebush twigs make incredible natural kindling. They are similar to hemlock trees in that they grow incredibly thin and small and can be found dry on the plant. When they are harvested, you can sometimes forgo tinder and just use the tiny twigs to get a fire going by lighting them directly with a match. The twigs also contain volatile oils (the same ones that give it the distinctive smell) that increase its flammability.

Naturalist note: The twigs, leaves, and buds of this plant can be made into a pleasant, spicy, aromatic tea. The plant has been used medicinally by Native tribes such as the Cherokee, Creek, and Iroquois. Spicebush is also an important food source for a number of native butterflies including the spicebush swallowtail.

HAWAII AND ALASKA

While the primary focus of this guide is the continental United States, Alaska and Hawaii are part of the United States even though they have wildly differing climates and bioregions. Alaska is a huge area encompassing everything from northern boreal forest to arctic conditions. Hawaii, on the other hand, is tropical Pacific. Here are some useful species found in both regions:

Alaska: Alaskan yellow cedar, Port Orford cedar, cottonwood, Alaskan birch
Hawaii: African tulip tree (invasive), *hau* (hibiscus species), bamboo

WORKING TOWARD EXPERTISE AND MASTERY

Can a mere human truly claim mastery over fire? Unlikely.

But with study and practice, learning and teaching, the boldest among us might achieve expertise. Skills are not built overnight, and working with a dynamic natural element means theory doesn't always translate into practice. While we may never truly master fire, we can build the skills to work with it.

There's no one way to learn fire, but expertise is built on a series of skills. The fire expertise challenges below are designed to build those skills. They are listed roughly in increasing order of difficulty. I believe that completing these challenges will set you on the road to expertise and perhaps awaken a desire to pursue mastery. They are also fun and useful, pursued independently or with family, Scouting, or outdoor groups.

FIRE EXPERTISE CHALLENGES

1) Get good at harvesting, gathering, and using all the components of fire.

This one's pretty straightforward. But it is important to get good at harvesting tinder, kindling, and fuel from your local regions and knowing

what works when and how.

2) Learn to make a one-match fire with more than one fire structure or design.
This requires expertise in your materials and getting proficient with matches as well.

3) Learn to start a fire with at least two different ignition sources.
Try one modern and one ancient!

4) Make fire in the rain and the snow.
Making fire in challenging conditions is an important and challenging skill. This is one of those skills that could save your life someday.

5) Get good at friction fires.
This skill is a lot harder than most people realize. It can take lots and lots of practice, perhaps months (or for some, years), but everybody I know who has done it says it's worth the effort. Making a fire by this ancient method is super rewarding and an incredible skill to know and perhaps share.

6) Make a fire, then carry a coal a considerable distance, keeping it alive to start another fire.
This is a tricky one especially when it's rainy, windy, or very cold. You need to make a big enough fire to have sufficient coals, and then you need to figure out a way to carry that coal—without extinguishing it—for quite a distance to make another fire (with new materials). This challenge harkens back to our ancestors and the fact that they didn't always start new fires every time with friction or other methods. Sometimes they carried pieces of fire with them—tending them, keeping them alive—and then created a new blaze somewhere else.

7) Cook an entire meal on a fire you make with fire resources you hand-harvest yourself.
For this challenge, you will harvest all the materials for your fire yourself: tinder, kindling, and fuel. Ideally, this is from the one location you are in.

Then you will build a big enough fire to cook an entire meal for you and your family and friends. Feel free to use multiple methods of cooking to prepare a feast!

8) Make a completely wild fire kit off the land.
I've done this only a few times myself, and in many ways the skills to do this may require skills beyond what we've talked about in this book. Basically, you need to gather all the materials you need to make a fire and *you make a fire kit off the land without a knife, rope, or other modern help*. This is tricky, hard work and unbelievably fulfilling. Here are a few hints: Hand-drill can be easier to make than bow-drill, broken stones make decent survival knives, and it is possible to make wild rope from vines, tree roots, and plants that make strong cordage.

9) Make a fire and tend it all night.
Fire-tending and keeping a fire going for long periods of time have become lost skills. For this challenge, set aside at least one full day. During the day select your site for your overnight fire-tending. Then gather materials and set everything up. Before dusk bring your fire to life, and then spend the whole night tending the fire. Be sure to take precautions such as having water nearby and having a support team of friends or family who are nearby if you need help. Allow your fire to die out at dawn, and watch the sunrise as one fire dies and another is born.

If you complete all the fire challenges, you will definitely be on the path to mastery. Even if you don't complete all of them, merely attempting and pursuing several of these challenges will greatly increase your skill and competency with fire. You will learn what many have learned over many generations: *Fire is an unbelievable mentor and teacher and can be an incredible lifelong friend*.

AFTERWORD

The first fire we light is the fire within.

—Campfire Girls and Boys motto

This book has ultimately been about one of the oldest relationships in existence. Many people might believe that as we go forward into an increasingly technologically focused twenty-first century, the old and sometimes ancient skills involving fire have become increasingly irrelevant. I would argue that the opposite is true. As our world becomes dominated more and more by technology and screen time, the deepest parts of our humanity long for more primal things like fire. We might not even be aware of how deep these longings are.

Over the last winter holiday break, I spent time with my in-laws in northern California. I was lucky enough to spend some pre-Christmas time in the South Bay area with my sister-in-law and her family, then head up to Sonoma for the Christmas holiday with my wife and son and stay at her mother's and stepfather's house. It was a lovely time for all of us, and one of the special gifts was what has become a rare treat for northern California: rain.

We had a long evening of cool rain with clouds during the day followed by a spectacular rainbow the next morning. This all took place near areas

that had been ravaged by wildfires on and off for the last several years. At both my sister-in-law's and at my wife's parents' house we had fires in the fireplace. The warmth, light, and vitality of the fire took the edge off the chill for sure, but more importantly it provided a little lift to the soul and psyche around the darkest time of the year.

For my wife, my son, and me, it was a sweet moment, but the irony of it was not lost on me either. Here we were burning wood and making fires for comfort in a land that had suffered tremendously from the more challenging sides of fire. This juxtaposition stays with me as we all face an uncertain future regarding climate change, our relationship to nature, and our complex relationship with resources all around us.

I contrast this holiday with another memory. Last year I was at the river near my house on an evening later in the summer. The rivers in our area are all glacially fed and so they stay quite cold even through the summer. When it gets into the 90s, people descend to plunge into the cool, refreshing, flowing water. But you can't stay in the water for long; it's easy to get hypothermic fast.

On this evening, many of the earlier swimmers had gone home, and I was hanging out on the rocky sandbar as two moms came down the hill with five children in tow. The kids looked like they were between the ages of 3 and 12, and the mothers watched as most of the kids threw themselves into the water. The younger ones waited dutifully for life jackets, and once the kids were safe in the correct depth of river water, the moms began to unpack their wagon.

I was excited to see that they had brought their dinner with them, and soon they were putting together a fire on the beach. They gathered some wood, mixed it with paper they had brought, and after some struggles had a little fire going. I initially thought I might have to go help, but I was impressed by their impromptu fire skills. Soon their five or six kids were huddling by the fire warming up from the chill of the river, even though the air temperature was still at least 75 degrees.

"What are you all going to cook?" I asked the two moms.

"Hotdogs and marshmallows!" was the quick reply.

Of course, I should have known. The moment brought back my own memory of cooking marshmallows over a fire on the Skykomish River with my two daughters, my son, my wife, and my mom earlier in the summer. For my daughter Tara, it was her first chance ever to cook on a fire. The

wonder and excitement in her eyes and her body washed over the rest of us, and for her it was the high point of the trip with her grandma.

I don’t know what the future holds for humans and our relationship with fire, but these moments and memories suggest to me that no matter how complicated the world gets, fire will always hold a place in the human heart.

APPENDIX I:
USEFUL PLANTS

Taking on the task of listing most if not all the useful species of trees and shrubs for fire-making in North America was quite a large project. Hopefully, the species listed in chapter 8 is comprehensive and useful for you wherever you are. However, I would be remiss if I did not include at least a short list of useful plants for fire-making as well. A comprehensive list of plants for fire-making would be a whole other book, but I've compiled this list of useful plants that are commonly found across the country, organized roughly in importance of use.

Cattail/*Typha latifolia:* Incredibly useful survival plant—quite possibly the most useful survival plant on the planet. You can harvest stalks for hand-drill. Fluffy seed heads work for tinder, and you can actually burn the dried stalks for effective fuel if you can't find firewood.

Mullein/*Verbascum thapsus* (and related species): Mullein makes incredible hand-drill stalks and, if it's thick enough, can even be made into bow-drill spindles. The dried leaves also make great tinder.

Bamboo/Cane/*Arundinaria:* Bamboo plants and American cane (a kind of bamboo that grows throughout the Southeast) are incredible survival tools as well. They can be made into a special friction fire kit known as a fire saw. The shavings of bamboo are also useful for starting a fire. You can burn bamboo as long as it is dry and you break up the sections of bamboo and split it. Finally, bamboo makes incredible containers for cooking.

Blackberry/Raspberry/*Rubus* spp.: Members of the raspberry and blackberry family can be useful for getting a fire. This includes well-known species such as wild raspberry and Himalayan blackberry but also lesser-known species such as salmonberry or thimbleberry. Most of the members of this group produce stems that are fibrous, woody, and pithy (soft on the inside). They can be used for hand-drill when harvested and dried when they are thinner and smaller. As they grow thicker and older, they can make a good bow-drill spindle. In most bioregions of the United States, at least one member of the *Rubus* genus is found.

Butterfly Bush/*Buddleja davidii:* This might seem an odd choice to include here since it's not widely known in its use for making fire. However, butterfly bush is the one species that I've been able to hand-harvest (by just breaking a dried stem off a plant) and get a hand-drill fire going with minimal effort outside of a desert region. I did this one summer with a few friends and got a hand-drill fire on a cottonwood root fireboard that was also literally broken off a dead tree. This was in late summer in the Pacific Northwest, and all of us were surprised by the effectiveness of this combination. Butterfly bush is a lovely, beautiful plant that smells of lilacs, but it is extremely invasive and damaging to native plants and their habitat. I encourage people to find it and harvest it in quantity for hand-drill! It grows on both coasts and in the Northeast and Midwest.

APPENDIX II:
FURTHER READING

Brown, Tom Jr. *A Field Guide to Wilderness Survival*, 1987.

Canterbury, Dave. *Bushcraft 101: A Field Guide to the Art of Wilderness Survival*, 2014.

Corcoran, Dan. *Ignite* e-book, available from wildernessawareness.org.

Elpel, Thomas J. *Primitive Living, Self-Sufficiency, and Survival Skills: A Field Guide to Primitive Skills*, 2004.

Hume, Daniel. *Firemaking: The Forgotten Art of Conjuring Flame with Spark, Tinder and Skill*, 2018.

Olsen, Larry Dean. *Outdoor Survival Skills*, 6th ed., 1997.

APPENDIX III: BIOREGIONAL SUPPORT TEAMS AND OTHER CONTRIBUTORS

When writing a book like this, it's impossible to have all the knowledge necessary to thoroughly cover an entire country. Below are people who contributed their expertise in specific areas of the country and who can be considered bioregional experts. They work or are connected with local survival and nature school teaching skills like those shared in this book.

ROCKY MOUNTAINS

Daniel Kirchhof sits daily with some of the greatest teachers of listening—the creek, trees, and wild animals of **Hawthorn Farm**'s woodlands. This listening guides his work as a visionary storyteller, carpenter/architect, and community builder. He creates farm and nature programs reconnecting people with food and hands-on skills and leads exhilarating archery programs, sharing life lessons through the magic of the bow and arrow. Whether tanning buckskins, tending his cabbage patch sauerkraut garden, building interesting structures, leading a community council for all ages, or singing a song with friends, Daniel brings an open, honest heart to his people.

DESERT SOUTHWEST

Aisling Eller grew up in southern Arizona and currently lives in the mountains of Arizona. She works as a forestry tech with the US Forest Service in the summer and just started as a Trailwalker for the Anasazi Foundation. She loves being able to incorporate making fire into her life as much as possible!

TEXAS

Dave Scott is the Founder of the Earth Native Wilderness School in Austin, Texas. Earth Native works tirelessly in pursuit of a mission to help people develop deep, lifelong relationships with nature through ancestral knowledge, wilderness skills, wildlife tracking, and nature connection mentoring. Earth Native offers a wide range of courses serving youth and adults ages 3 to 99. More information can be found at www.EarthNativeSchool.com.

CALIFORNIA

Mia Andler is the founder and director of the **Vilda Nature School** in northern California. Originally from Finland, Mia has studied the regenerative practices of earth-based cultures around the world and has been teaching children and adults for over twenty years. She directed and co-founded the Bay Area branch of Trackers Earth, managed several outdoor education programs, and taught nature education in many California schools. She is the co-author of *The Bay Area Forager*, a guide to edible wild plants of the Bay Area.

MIDWEST

Kriya Miller is the co-founder and co-executive director of the **Human-Nature School,** a rewilding and deep nature school located in northern Michigan.

NORTHEAST

Evan "Ash" Young (they/them) is a queer rewilder and staff member at the Vermont Wilderness School. Their current passion projects around nature connection include exploring the idea that the journey of nature connection and the journey of equity are intertwined at a deep level, rejuvenating ancient Irish scout cultures, and weaving cultural systems that naturally flow toward belonging in nature.

Michaela Himelfarb is a Program Team Leader at the **Wild Earth School** in New York's Hudson Valley region. The school shares outdoor experiences for people of all ages using a team of multigenerational mentors as well as curriculum that explores everything from native technologies to natural sciences.

SOUTHEAST

Erin Maureen "Soupy" Campbell is the Youth Programs Coordinator at **Living Earth School** in Virginia. Soupy became wildly curious about the natural world during three years in the Pacific Northwest where she studied at and worked for the Wilderness Awareness School. There she sat against many a western red cedar tree, curled up on rainy nights in shelters piled high with sword ferns, and followed wolves in the snow and elk on sandy river bottomlands. Soupy is a UVA grad from Springfield, and five years back in her native Virginia has helped her fall completely in love with these hardwood hills, humid summers, and swift-running streams. When she's not scouring mud puddles for tracks or harvesting nettles to make pesto, Soupy can be found building her own tiny house on wheels, singing in harmony and writing snail-mail letters.

OTHER CONTRIBUTORS

Roy Ashton is a wilderness guide and nature connection facilitator leading African bush immersions on foot. He has a passion for wildlife tracking, friction fires, and learning directly from traditional hunter-gatherers. His passion for hand-drill fires once led him to light over 500 in the space of one year. He's one of only a few people capable of what Tom Brown Jr. calls "The Creator's Fire," hand-drill with hands going only *up* the drill. Find more information at www.royashton.com.

Natalie Rivera-Booth has been working in the 8-Shields nature connection mentoring model since 2002. She is a mother, storyteller, keeper of ancestor connections, and singer to the world. Currently Natalie has her own business providing personalized workshop intensives for individuals and small groups in the topics of deep personal transformation, sacred storytelling, and ancestral connections. She lives in the heartbreakingly beautiful Pacific Northwest. Contact her at Natalie@Well-Within.org.

Quinn Bailey is a poet, naturalist, and wildlife tracker who for the last seven years has been helping people find a deeper connection to the natural world through ancestral skills such as bird language, wilderness living, and cultural mentoring. Growing up between Orcas Island, Washington, and Big Sur, California, he discovered a strong sense of belonging and curiosity about the natural world and feels most at home wandering the wooded hills and rocky shores surrounding the Salish Sea where he now lives. Quinn's

first collection of poetry, *The Currents of the World*, was named as a finalist in Homebound Publications' poetry prize.

ACKNOWLEDGMENTS

Writing a book such as this definitely makes me aware of the extremely long lineage of teachers and mentors who have passed down ancient wisdom regarding fire and our relationship to fire. This line of teachers has no beginning, and hopefully this book helps it continue into the future, but I wanted to start by acknowledging where this all comes from!

I'd like to give a special thanks to Katie Benoit, who helped bring this project alive, and to Katie O'Dell, who helped see it to fruition. Thanks as well to all on the FalconGuides team for helping get this book out to the world.

Several experts lent their knowledge and experience to this project, so a special shout out to all my bioregional experts including Daniel Kirchhof, Dave Scott, Michaela Himelfarb, Aisling Eller, Erin Campbell, Evan "Ash" Young, Kriya Miller, Mia Andler, and all the other experts I've encountered and worked with over the years.

I also want to give a big thanks to Natalie Rivera-Booth, Quinn Bailey, and Roy Ashton for sharing their stories and poetry to enrich the bigger story being told here.

Finally, big love out to my entire family, especially my loving and supportive wife Karen, my two daughters Katie and Tara, and my son Orion. Thanks for all the inspiration, support, and joy!

ABOUT THE AUTHOR

Nate Summers, author of *Primal: Why We Long to Be Wild and Free*, has been a survival skills instructor for over twenty years with a background in anthropology, Asian studies, and natural medicine. He taught and directed at the Wilderness Awareness School for over fifteen years and has served as faculty for the Desert Institute of Healing Arts, the Asian Institute of Medical Studies, and as adjunct faculty for Prescott College. Nate's passions include ethnobotany, natural mentoring, hunter-gatherer childhoods, natural movement, herbal medicine, internal martial arts, and leadership. Nate likes to fish, practice internal martial arts, go on adventures with his children, and gather wild foods and medicine.

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